Electrical West

With which is consolidated the Journal of Electricity

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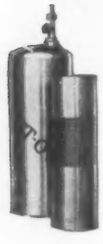

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RECENT INDUSTRIAL POWER STATIONS

RECENT industrial power stations completed or in progress include work for the following clients: Vacuum Oil Company, Atmospheric Nitrogen Corporation, National Carbon Company, Inc., Pittsburgh Plate Glass Company, S K F Ball Bearing Company, American Sugar Refining Company, Mathieson Alkali Works, Inc., Bethlehem Steel Company, Westinghouse Lamp Company, United States Rubber Company, The Flintkote Company, Pacific Coast Condensed Milk Company, Standard Underground Cable Company, Firestone Tire & Rubber Company.

The work is varied. It includes the building of new steam and power stations, increasing the capacity of present plants, revamping present equipment to meet demands of economy, and rehabilitating old plants.

Illustrated is the Twin Cities Steam Power Plant of the Ford Motor Company at St. Paul.

STONE & WEBSTER

INCORPORATED

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Night Football Popular as Result of

Eight-foot-candle Outdoor Lighting

of Pasadena Rose Bowl

LIGHTING of the Pasadena Rose Bowl in order to permit the staging of football games and other athletic contests at night, marks in a dramatic way one more step across the frontiers of darkness which have for so long confined the activities of mankind to the brief daily span of the sun. Aside from its more romantic aspects, this lighting job presents a number of points of interest in modern illuminating engineering.

The Pasadena Rose Bowl is the first stadium on the Pacific Coast to be lighted, and is said to be the first stadium in this country to be properly lighted for the playing of night football to the satisfaction of both players and spectators. As this is written, five games have already been played under the searching white rays of 40 1,500-watt incandescent units. Players have given performances at least equal to anything to be seen by day. Sports writers have been loud in their praises of the satisfactory field illumination, and spectators have registered at the box office that most important of all approvals, cash over the counter in unprecedented quantites. More than 25,000 people turned out for the first game between Occidental College and the University of Arizona on the evening of Sept. 27, and the gate receipts for that one game were far enough ahead of normal to have paid off the entire $16,000 that it cost for illuminating equipment and installation.

The City of Pasadena decided almost a year ago that

Eight-foot-candle illumination intensity makes football playing easy for teams and interesting for spectators at Pasadena Rose Bowl

One of the central towers with eight 1,500-watt units directed toward playing field

lighting equipment should be installed in the Rose Bowl. Several months were then devoted to planning and investigation by the Pasadena Municipal Light and Power Department, under the direction of B. F. DeLanty, and a contract was finally signed with Horace L. White, illuminating engineer and manager of the Crouse-Hinds Los Angeles branch office, on May 7, 1929. Stadiums had previously been lighted in a number of Eastern cities and six foot-candles of illumination over every portion of the playing surface had been accepted as standard practice. The City of Pasadena wanted even better lighting and demanded a uniform illumination of eight foot-candles over the entire playing area and to a point 50 ft. in the air anywhere above the playing area. Further requirements were that there should be no glare either for players or for spectators in the stands, and that the system should employ incandescent units.

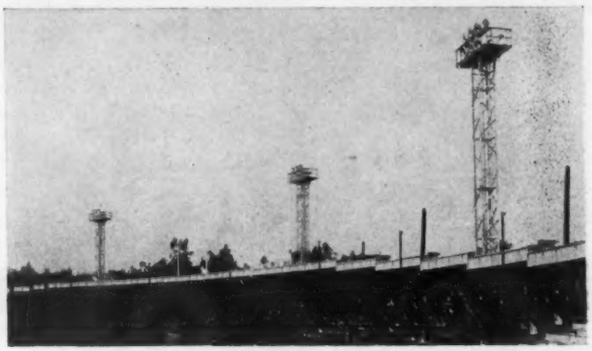
Working to these specifications, Mr. White designed the system which is now in use and it was installed by the City of Pasadena. As a unit the Crouse-Hinds LCE-24, 1,500-watt lamp was chosen. This light is 30 in. in outside diameter, is equipped with Pyrex mirrors and lenses, with a 40-deg. spread lense and top cut-off louvers to prevent glare in the opposite stands. It is absolutely dust tight and is cooled by radiation. It was necessary to use 40 of these units in order to obtain the required degree of illumination, and it was necessary to place the source of light at a point 110 ft. above the surface of the playing field in order to provide sufficient light above the field without objectionable glare in the stands.

Fortunately the Rose Bowl is in fact a bowl,—a great bowl of earth with tiers of concrete seats around the interior and a good solid bank of earth around the rim at an altitude of 50 ft. above the level of the playing field. The lighting units were mounted therefore on 60-ft. towers erected along the rim of the bowl. Six of these towers were used, each of Truscon steel construction, and each was provided with a working platform around the lights at the top. Three towers were placed on each side of the field, the greatest distance between towers across the field being 700 ft. and the distance across one bank of three towers 375 ft. Since the length of a football field, counting the two end zones, is 360 ft., this means that one tower on each side is placed directly opposite the 50-yd. line across the center of the field, and that the other two towers at each end are placed just 7½ ft. farther down the field than the playing field limit.

Eight lamp units are mounted on each center tower and six units on each of the end towers. These units are focused and directed so that the playing area is completely covered by the lights on any one tower. Thus the field is completely lighted from six different directions, shadows are minimized, and an almost perfect distribution of light is obtained, there being none of the light and dark streaks so often associated with outdoor night lighting.

Taking a lateral cross section of the Rose Bowl, the lights are so focused that the entire direct beam of any unit is directed upon the playing area, the lower limit of the beam clearing the nearer stands beneath the tower while the upper limit of the light beam does not reach up into the opposite stands. The upper limits of opposite beams cross above the center of the field at an altitude of 45 ft. Spill light gives sufficient illumination beyond the point of direct illumination to an altitude of at least 110 ft. above the field, and no player has yet been able to punt a football up out of the light. The stands on each side of the bowl are brightly illuminated by spill light emanating from the beams of the lamps mounted directly above.

The resultant illumination of the field was tested with a MacBeth illuminometer on 50-ft. centers everywhere over the surface of the field and at altitudes of 50 ft., and was found uniformly to exceed by a comfortable margin the requirement of eight foot-candles Not only is the volume of light satisfactory, but the color of incandescent light has proved to be most nearly normal for outdoor playing. Spectators in the stands can never look directly into a beam of light as is so often the case when sitting facing the sun for a daylight game, and neither team need ever fear the disadvantage of playing facing the sun.



Bank of three towers on east rim of Rose Bowl

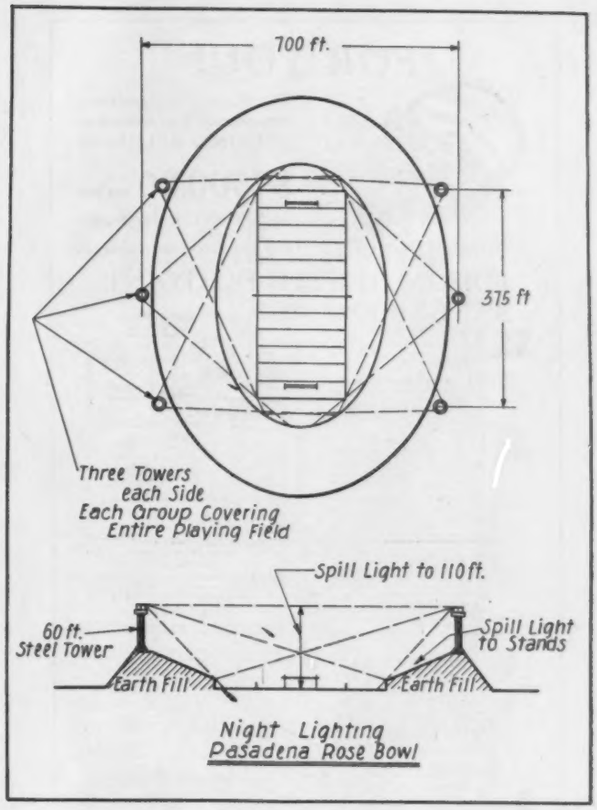
In order to assure the utmost reliability of the system during the playing of big games with many thousands of people present, the City of Pasadena has installed an extremely complete and flexible control system. Main line power of 2,300 volts is brought directly to a transformer at the base of each tower, from which point it proceeds as 110-220 volt to a cabinet at the top of the tower. Each lamp is individually switched and fused in this cabinet and the failure of any one lamp does not impair the operation of any other. A central control room is situated underneath the stadium, from which point the towers may be controlled in pairs. If for any reason conditions should dictate that one of a pair of towers should remain dark, this may be accomplished by means of a main switch at the base of each tower, so that any tower may be controlled as a unit without climbing to the top and switching individual lamps.

A wide platform provides easy access to any lamp needing attention, while the ladder leading up to this platform is equipped with a cut-off and trap-door near the bottom of the tower to prevent unauthorized persons from tampering with the equipment. All installation was performed by the Light and Power Department of the City of Pasadena under the direction of B. F. DeLanty, and no expense was spared to make the installation entirely satisfactory and thoroughly permanent in nature.

The complete cost of equipment and installation has not exceeded $16,000, and, as before stated, the increased gate receipts would have repaid that expenditure on the first night that a game was played. Aside from the mere novelty of night football, there are many features of convenience and comfort. It is usually about the right temperature in the early evening to enjoy such an activity, whereas too many afternoon games are played during the sweltering heat. Also, the cooler and clearer air of the evening helps the players to engage in a faster and better played contest. Further, it is a great convenience to the average man to be able to attend such a contest during the evening hours when he is free, and many more persons can attend at night than are free to come even on Saturday afternoons. Still another angle is that conflict with other activities or other games is thus eliminated and people may see a game on Friday night with the entire week-end free for some other engagement, or a "fan" may attend one game on Friday evening and another on Saturday afternoon, whereas if both were played on Saturday afternoon a choice would be necessary with the loss of one or the other.

Many other ways in which this night lighting installaiton has magnified the possibilities of the Rose Bowl could be cited, but it is apparent that simply through the medium of night lighting the Rose Bowl has been lifted into an enviable position of popularity with the football "fans." As a result, the various football teams are scheduling all games possible for night dates there, and the local season has taken on double interest.

From the standpoint of power line load this particular installation may not seem of great importance. There is, however, a more potent significance to this lighting job, and it is found in the reaction which such a feat of illumination will constantly have upon the thousands of people who are privileged to witness it in operation. As the general public is acquainted with the possibilities of outdoor night lighting, as well as the indoor installations with which it is more familiar, the demand for such services will certainly continue to increase, and with all outdoors remaining to be lighted up, there is no limit to the possibilities for adding to the world's activity, enjoyment and wealth through the skill of the illuminating engineer and the service of the power companies.



Plan and profile of Rose Bowl showing arrangement of lighting equipment

Domestic Energy Price Goes Down While Consumption Increases

ACCORDING to the statistics for the electric light and power industry issued by the statistical research department of the National Electric Light Association, the downward trend of the average price of domestic electric service is steadily continuing. Taking the United States as a whole, the average for the twelve months ending with Sept. 30 was 6.30 cents per kilowatt-hour. This compares with an average of 6.40 cents for the period ending with June 30, with 6.50 cents for the period ending with March 31, and with 6.55 cents for the calendar year of 1928.

Coincidentally with this progressive decline in the average rates, the amount of electricity used by the average customer has shown a steady increase. During the twelve months ending with Sept. 30 the average for the United States as a whole was 487 kw.-hr., as compared with 459 for the calendar year of 1928. For the entire year of 1929, present trends indicate an annual use of 500 kw.-hr.; an increase of 41 units per consumer, or of nearly 9 per cent over the previous year.

FOR YOU!
The Biggest Extra-Money Opportunity Ever Offered to EDISON EMPLOYEES
$7500.00 in Cash
And a Ford Car (any model)
WILL BE DISTRIBUTED DURING THE
EDISON HI-SPEED HOTPOINT RANGE CAMPAIGN
$2 for Every Name
$1 Extra for Every Name
And a Ford Car Given Away
It's Easy to Get Your Share
You Needn't "Sell"—Just Interview
Get Some Names Every Day
Especially Thursday
"The Range that 20,000 Edison Customers Have Specified."
Six Big Talking Points
READ THIS
THE MERCHANDISING DEPARTMENT OF THE SOUTHERN CALIFORNIA EDISON COMPANY
Pay to the Order of
$7500.00
The BIG NEWS about this Extra Money for you will be mailed to you in a few days.
Watch for it!
$7500.00 and a Ford Car ...Model A... any style
It's an Awful Lot of Money!
And It's Going to be Given Away!..
You'll hear more about this on Oct. 12th.
~BUSY BUTTONS

To Sell Employees

Some of the direct-mail matter sent out to interest Edison employees in the range campaign

"Rangeday"

Calendar Changed for Southern California Range Campaign in Which Employees Interview 50,000 Prospects to Sell 2,500 Ranges

NOT THURSDAY, but "Rangeday." The calendar has been changed again, not in Russia, but in the territory of the Southern California Edison Company during the eight weeks' Hotpoint range campaign covering the period from Oct. 18 to Dec. 12. During this time plans call for the addition of 2,500 ranges to the 20,000 already on the lines of that utility.

Altering the calendar is but one of the many features of a comprehensive campaign. "Rangeday" of each week has been set aside for interviewing 50,000 selected prospects by employees for the purpose of uncovering the 2,500 customers who will purchase ranges during the campaign.

Two sales jobs were involved in the campaign. The first was based upon the recognition that every employee of the Edison company is a potential salesman. To secure the maximum effort from this latent sales force then became a problem. Considerable success had been enjoyed in the past through employee co-operation in sales campaigns, but it was felt that in this particular instance special steps were necessary to arouse the greatest possible interest.

A special direct-mail advertising campaign was prepared for circulation among all employees of the company. The first two pieces were teasers announcing that $7,500 in extra bonus money would be available to employees for Christmas. The final piece disclosed the plan and was mailed so as to be received a day or two prior to the meetings that were to be held simultaneously in every district for outlining all of the particulars of the campaign.

Sales specialists, division sales managers, district managers, district superintendents, chief clerks and home economists received complete details of the campaign at a two-day sales convention at the Huntington Hotel, Pasadena, held several days prior to the opening of the campaign. This was the second annual convention of this character held by the company with approximately 350 in attendance. Talks, playlets, stunts, motion pictures and other means were taken to explain the campaign and the points of the Hotpoint Christmas range that was to be featured.

On the Tuesday preceding the opening of the campaign, meetings of all employees were held in every district when complete plans were outlined. Briefly, the plan to be followed was this: All employees that could be spared were to be organized into teams on each "Rangeday" for the purpose of making a house-to-house canvass to uncover prospects. Each employee was to be armed with a prospect card on which were listed the common

Replaces

Thursday

appliances. The make, type and age of the present cooking equipment in the customer's home were to be obtained and the details of the present campaign, including the generous trade-in allowance that was being made on old cooking equipment were to be explained. If the customer was interested an appointment was to be made for an appraiser (who was the sales specialist) to call.

For every prospect turned in that was closed by the sales specialist the employee was to receive a bonus of $2. As soon as two of any given employee's prospects were closed the bonus was to be increased to $3 per range. In addition, each employee for every prospect closed received a ticket giving him or her a chance on a drawing for any model Ford car selected. Each sales specialist received a ticket on the car for every one of his own prospects that he closed during the campaign.

Added bonus money to the extent of $25 per district was made available to be distributed by the district manager upon some basis agreeable to the employees. Moreover, weekly prizes consisting of Telechron clocks were donated by the General Electric Supply Corporation to be given to employees and sales specialists making the best records each week.

A flat quota of 24 ranges for the campaign was assigned to each sales specialist. In addition to regular commissions, a bonus of $25 was to be paid as soon as this quota had been reached, and an extra bonus of $2 per range was to be paid for every sale exceeding the quota.

The range selected for the campaign was sold at a flat price of $239.50 installed, or $212.50 where wiring was already in or where the customer desired to have the wiring done himself. A trade-in allowance of 10 per cent of the cash list price was allowed on old cooking equipment. Old equipment turned in was accepted as the down payment, or where there was no trade-in, a down payment of 10 per cent was exacted.

Dealers throughout the territory were offered the opportunity of participating in the campaign on the same basis as the company. Based upon past experience in range campaigns it was expected that between 500 and 600 ranges would be sold by dealers.

With details for employee and dealer co-operation complete, attention was turned next to selling the customer. The advertising campaign involved extensive use of both direct-mail and newspaper copy.

The newspaper campaign called for the use of seven advertisements. In the 115 weekly papers in the territory of the company 3 columns by 10 in. copy was used. In the 50 daily papers the copy ran 3 columns by 12 in. Thus every newspaper in the territory carried an advertisement for practically every week of the campaign.

Great reliance was placed upon an elaborate direct-mail campaign. Four pieces, three written by the Edison company advertising department and the fourth from the Hotpoint company, were mailed to 50,000 selected customers on the lines of the company. In addition,

..Why not trade in your old range?
Graf Zeppelin Cooking for Your Kitchen
AT LAST! A better, faster, electric range at a lower price!
WHAT IS MY RANGE WORTH ON A NEW HOTPOINT HI-SPEED AUTOMATIC?
THE NEW EDISON Hotpoint HI-SPEED RANGE
At the lowest price ever offered for an electric range of this quality
NO DOWN PAYMENT (your old range, only)
LOWER ELECTRIC RATE
WHAT YOU GET
Mail card to learn what your old range is worth
All Outdoors Invites You; your kitchen will not need you
"But isn't it terribly expensive?" No . just read the next page.

Easier to Own . . . Better than Ever . . . . MODERNIZE YOUR KITCHEN NOW!
NEW FEATURES:
WHAT IT BRINGS YOU
The New Edison HOTPOINT Hi-Speed Electric Range
The MODERN Stove for the MODERN Woman.
No PAYMENT DUE! . . . Just Turn in Your Old Range
MAIL THE CARD TODAY

To Sell Customers

Newspaper copy and samples of direct-mail matter for selling ranges to Edison customers

SURVEY CARD

SOUTHERN CALIFORNIA EDISON COMPANY

*Name*_____

*Address*_____

CHECK ITEMS WHICH CONSUMER OWNS

☐ Iron	☐ Vacuum Cleaner	☐ What type range used?
☐ Percolator	☐ Ironer	Make_____
☐ Waffle Iron	☐ Hair Waver	Model_____
☐ Toaster	☐ Heater	Age_____
☐ Washing Machine	☐ Electric Refrigerator	☐ Shall an Appraiser Call?
☐ Warming Pad	☐ Satisfactory?	

*Employee*_____

*District*_____ *Date*_____

(REMARKS ON REVERSE SIDE)

Sample survey card

250,000 broadsides were sent out to all customers with the bills mailed after Oct. 15. With every broadside there was sent a return post card. Illustrations of the newspaper and direct-mail advertising accompany this article.

The campaign was devised by H. C. Rice, merchandising manager, R. C. Smith, advertising manager, and R. G. Kenyon, assistant advertising manager, of the Southern California Edison Company, and P. H. Booth and R. W. Turnbull of the Edison Electric Appliance Company, and its execution is under the supervision of W. L. Frost, general commercial manager of the Southern California Edison Company. As this is written, the campaign has run four weeks and total sales to date have been 1,043 ranges.

Decentralized Dispatching Improves System Operation

By H. W. TICE

Operating Engineer, Southern California Edison Company, Los Angeles

DECENTRALIZED dispatching as applied by the Southern California Edison Company to its generation, transmission and distribution system is a distinct contribution towards increased reliability and continuity of service in the electrical industry. It places the responsibility for maintaining service through a given group of lines and stations directly in the hands of the man who is in a position to do the necessary switching without dependence upon communication.

There are a number of such points of control throughout the system, known as switching centers, from which all detailed dispatching is transacted. These switching centers are the result of developments which began five years ago when the first switching centers were established in outlying districts to dispatch the local transmission and distribution system. The step was taken to relieve the central dispatching organization of certain detail switching which could be transacted more effectively from local stations due to better communication facilities and personal contact with the local transmission and distribution organizations. Because of the phenominal growth and development in southern and central California, and the rigid service requirements, further decentralization of dispatching became necessary, resulting in the present organization of 24 switching centers from which all the detail dispatching is transacted, and a group of supervisory dispatchers who are responsible for the co-ordination and supervision of all dispatching operations.

Thus the decentralized dispatching organization, as shown in the accompanying diagram, consists of a supervising dispatching office and 24 switching centers. The work is divided into three major groups.

The high-tension transmission system with its 837 circuit-miles of 220-kv. lines, 645,300 hp. of generating capacity in five hydro-electric plants and one steam plant, is controlled from five switching centers—Big Creek No. 3, Magunden, Laguna Bell, Lighthipe and the Long Beach steam plant.

The intermediate transmission system with its 1,915 circuit-miles of 66- and 33-kv. lines, 473,560 hp. of generating capacity in 20 hydro-electric plants and four steam plants, is controlled from twelve switching centers —Laguna Bell, Lighthipe, Long Beach steam plant, Rector, Vestal, Saugus, Eagle Rock, La Fresa, Saticoy, Katella, Chino and Colton. Three of these switching centers are combination 220/66-kv. substations and four are combination 66/16/11-kv. substations, as shown in Fig. 1.

The major distribution system with its 3,353 circuit-miles of 16- and 11-kv. distribution lines is controlled from fourteen switching centers—Saticoy, Katella, Chino, Colton, Macneil, Alhambra, Vernon, Culver, Torrance, State St. (Long Beach), Santa Barbara, Lancaster, La Habra and Dalton.

The 2,300- and 4,000-volt distribution system is controlled directly by the distribution organization in each district. There are 32 districts at the present time, covering a territory of 55,000 square miles, with fourteen

switching centers to dispatch all operations. Ultimately there will be a distribution switching center for each district.

Dispatching operations in each switching center are carried out by the regular substation organization as an essential part of the operation of that particular station. Experience has shown that this additional work and responsibility does not increase the personnel in the switching centers, but does require a more highly developed and efficient operating organization.

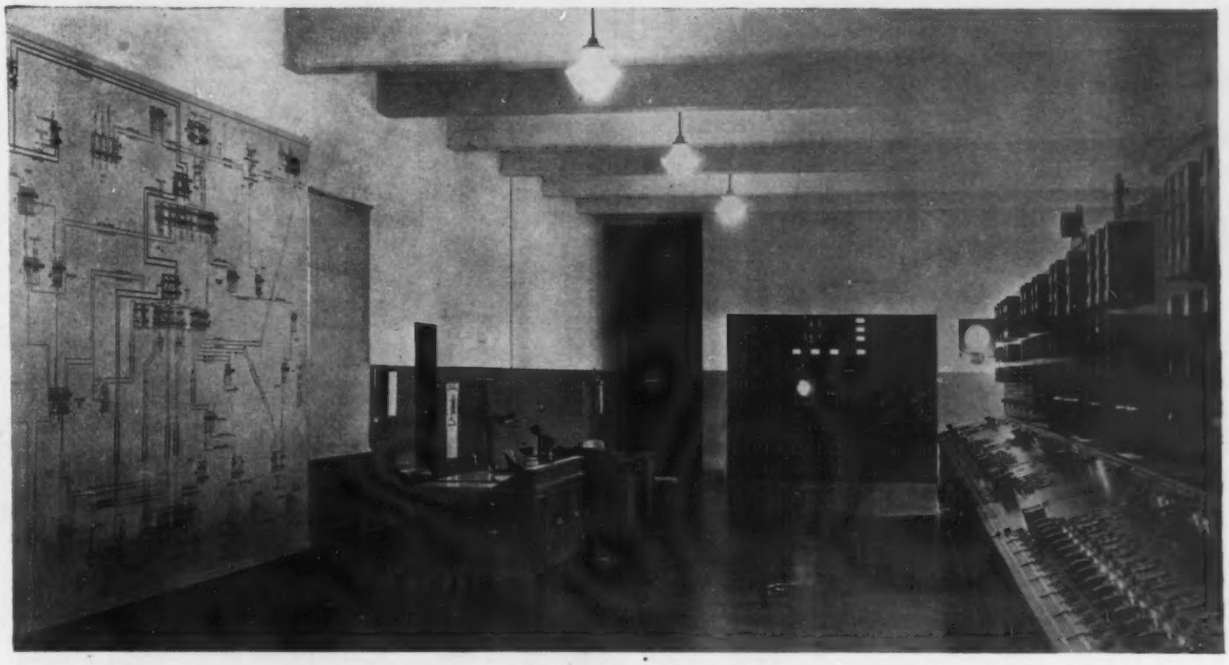
Method of Operation

Operating methods consist primarily of sectionalizing the system into well defined groups of lines and stations and establishing in each group one or more switching centers chosen with respect to their physical location and ability to serve a large percentage of the stations in the group with one or more radial lines.

Dispatching of routine operations in the group, such as switching of lines and equipment, issuing of working clearances, adjustment of load distribution and requests for equipment out of service, are carried out in the usual manner by the switching center in each group. These operations can be dispatched with unusual promptness due to the fact that the switching center is the source for practically all of the stations in the group. Thus all operations at the source are handled directly, and the stations at the receiving end have a direct line of communication with the switching center. The patrolmen and division superintendents as a rule have their headquarters at the major switching centers, thereby establishing a close personal contact within the organization, all of which results in better co-ordination and efficiency throughout.

During emergency operations practically all of the operators' time can be devoted to obesrvations and necessary switching to maintain service on the lines and stations in the group. The switching centers are so situated that 90 per cent of all the transmission substations have one or more lines radiating from the switching center having jurisdiction over such lines. Consequently, in the event of an interruption to service,

La Habra distribution switching center, typical of its class. The switching diagram board is so placed that the operator-dispatcher may readily see it while using his telephones



Lighthipe substation operating room, a typical transmission switching or dispatching center, showing the 10 x 14-ft local system and switching diagram board behind the operator's desk. Small pegs indicate the position of switches and the condition of equipment

as indicated by the operation of automatic switches on loss of load, service can be restored in the length of time required by the operator to do the necessary switching.

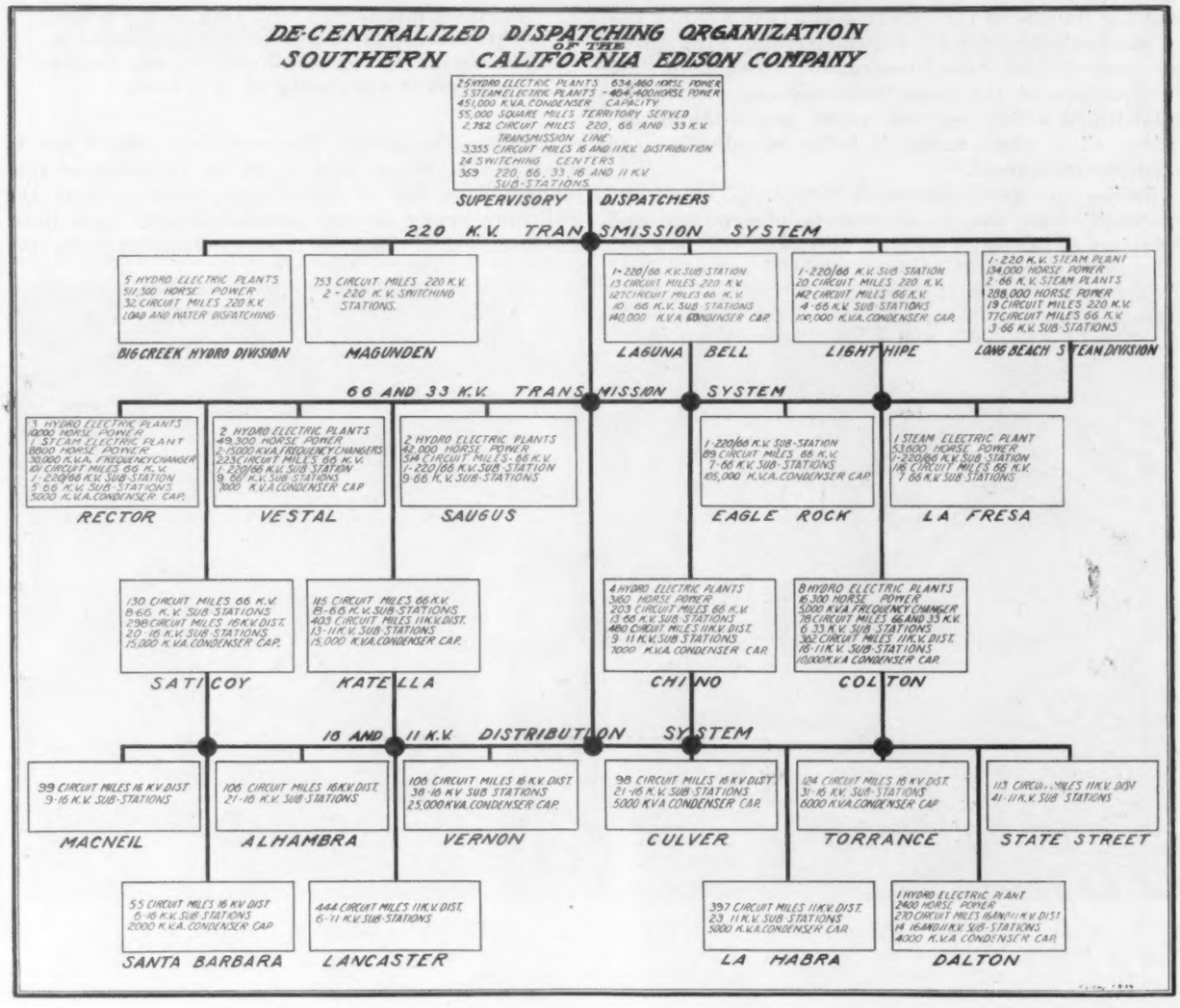
Operations on the 220-kv. system are divided into five groups, with the Big Creek "division operators" responsible for water and load dispatching and all the necessary switching in the Big Creek division. Magunden switching center is approximately the half-way point on the 220-kv. system. There, control of all three of the 220-kv. lines, both north and south, places that station in a position to maintain transmission service south to the 220-kv. distributing points.

Power is deilvered into the southern portion of the 220-kv. transmission system by the Long Beach No. 3 steam plant, while the No. 1 and No. 2 plants feed into the 66-kv. system. This makes the Long Beach "division operators" responsible for maintaining normal conditions on both the 220- and 66-kv. lines.

Lighthipe and Laguna Bell substations, two of the major 220/66-kv. distributing points with a combined capacity of 440,000 hp., are combination 220- and 66-kv. switching centers and also the main 220-kv. ties between steam and hydro generation. Either one or the other of these two stations, depending upon the proportion of steam to hydro capacity in operation at the time, serves as a point of separation between steam and hydro in the event of a major disturbance that is of sufficient magnitude and duration to cause the two ends of the long system to swing out of step. This separation, which takes place if conditions indicate a slow recovery, removes the out-of-step conditions and allows prompt recovery of both ends of the system. The two systems then are re-synchronized and normal conditions are re-established thereby. While this separation is a very rare occurrence, it has been necessary to carry out this operating plan to restore the system to "normalcy" as quickly as possible. The out-of-step condition has occurred because of lack of adequate protection, or failure of the protective equipment to clear the fault promptly.

With provisions for maintaining service on the 220-kv. "backbone" of the system, the responsibility then is up to the 220/66-kv. distributing point. Here again the dispatching is simplified because of the large percentage of stations served by radial 66-kv. feeders. In addition to the eight major 66-kv. distributing points there are four combination 66-33-16-11-kv. switching centers in the outlying districts, to complete the dispatching of the transmission system. Responsibility then is taken over by the distribution switching centers and the distribution organizations in the district.

Thus dispatching becomes a progressive operation from the point of generation to the consumer with the


DE-CENTRALIZED DISPATCHING ORGANIZATION OF THE SOUTHERN CALIFORNIA EDISON COMPANY
25 HYDRO ELECTRIC PLANTS 634,460 HORSE POWER
5 STEAM ELECTRIC PLANTS - 484,400 HORSE POWER
451,000 K.V.A. CONDENSER CAPACITY
55,000 SQUARE MILES TERRITORY SERVED
2,752 CIRCUIT MILES 220, 66 AND 33 K.V. TRANSMISSION LINE
3355 CIRCUIT MILES 16 AND 11 K.V. DISTRIBUTION
24 SWITCHING CENTERS
369 220, 66, 33, 16 AND 11 K.V. SUB-STATIONS
SUPERVISORY DISPATCHERS
220 K.V. TRANSMISSION SYSTEM
5 HYDRO ELECTRIC PLANTS 511,300 HORSE POWER 32 CIRCUIT MILES 220 K.V. LOAD AND WATER DISPATCHING
BIG CREEK HYDRO DIVISION
753 CIRCUIT MILES 220 K.V. 2 - 220 K.V. SWITCHING STATIONS.
MAGUNDEN
1 - 220/66 K.V. SUB STATION 13 CIRCUIT MILES 220 K.V. 127 CIRCUIT MILES 66 K.V. 10 66 K.V. SUB STATIONS 140,000 K.V.A. CONDENSER CAP.
LAGUNA BELL
1 - 220/66 K.V. SUB STATION 20 CIRCUIT MILES 220 K.V. 142 CIRCUIT MILES 66 K.V. 4 - 66 K.V. SUB STATIONS 190,000 K.V.A. CONDENSER CAP.
LIGHTHIPE
1 - 220 K.V. STEAM PLANT 134,000 HORSE POWER 2 - 66 K.V. STEAM PLANTS 208,000 HORSE POWER 19 CIRCUIT MILES 220 K.V. 77 CIRCUIT MILES 66 K.V. 3 66 K.V. SUB-STATIONS
LONG BEACH STEAM DIVISION
66 AND 33 K.V. TRANSMISSION SYSTEM
3 HYDRO ELECTRIC PLANTS 10000 HORSE POWER 1 STEAM ELECTRIC PLANT 8800 HORSE POWER 30,000 K.V.A. FREQUENCY CHANGER 20 CIRCUIT MILES 66 K.V. 1 - 220/66 K.V. SUB-STATION 5 66 K.V. SUB-STATIONS 5000 K.V.A. CONDENSER CAP.
RECTOR
2 HYDRO ELECTRIC PLANTS 49,300 HORSE POWER 2-15000 KVA FREQUENCY CHANGERS 223 CIRCUIT MILES 66 K.V. 1 - 220/66 K.V. SUB STATION 9 66 K.V. SUB STATIONS 7000 K.V.A. CONDENSER CAP
VESTAL
2 HYDRO ELECTRIC PLANTS 42,000 HORSE POWER 514 CIRCUIT MILES 66 K.V. 1 - 220/66 K.V. SUB STATION 9 66 K.V. SUB-STATIONS
SAUGUS
1 - 220/66 K.V. SUB-STATION 69 CIRCUIT MILES 66 K.V. 7 66 K.V. SUB-STATIONS 105,000 K.V.A. CONDENSER CAP.
EAGLE ROCK
1 STEAM ELECTRIC PLANT 53,600 HORSE POWER 1 - 220/66 K.V. SUB STATION 196 CIRCUIT MILES 66 K.V. 7 66 K.V. SUB STATIONS
LA FRESA
130 CIRCUIT MILES 66 K.V. 8 66 K.V. SUB STATIONS 298 CIRCUIT MILES 16 K.V. DIST. 20 16 K.V. SUB STATIONS 15,000 K.V.A. CONDENSER CAP.
SATICOY
115 CIRCUIT MILES 66 K.V. 18 - 6.6 K.V. SUB-STATIONS 403 CIRCUIT MILES 11 K.V. DIST. 13 - 11 K.V. SUB-STATIONS 13,000 K.V.A. CONDENSER CAP.
KATELLA
4 HYDRO ELECTRIC PLANTS 360 HORSE POWER 203 CIRCUIT MILES 66 K.V. 13 66 K.V. SUB-STATIONS 480 CIRCUIT MILES 11 K.V. DIST. 9 11 K.V. SUB STATIONS 7000 K.V.A. CONDENSER CAP.
CHINO
8 HYDRO ELECTRIC PLANTS 16,300 HORSE POWER 5000 K.V.A. FREQUENCY CHANGER 78 CIRCUIT MILES 66 AND 33 K.V. 6 33 K.V. SUB STATIONS 362 CIRCUIT MILES 11 K.V. DIST. 16 - 11 K.V. SUB-STATIONS 101,000 K.V.A. CONDENSER CAP.
COLTON
16 AND 11 K.V. DISTRIBUTION SYSTEM
99 CIRCUIT MILES 16 K.V. DIST. 9 - 16 K.V. SUB-STATIONS
MACNEIL
106 CIRCUIT MILES 16 K.V. DIST. 21 - 16 K.V. SUB STATIONS
ALHAMBRA
106 CIRCUIT MILES 16 K.V. DIST. 38 - 16 K.V. SUB STATIONS 25,000 K.V.A. CONDENSER CAP.
VERNON
98 CIRCUIT MILES 16 K.V. DIST. 21 - 16 K.V. SUB STATIONS 5000 K.V.A. CONDENSER CAP.
CULVER
124 CIRCUIT MILES 16 K.V. DIST. 31 - 16 K.V. SUB-STATIONS 6000 K.V.A. CONDENSER CAP.
TORRANCE
113 CIRCUIT MILES 11 K.V. DIST. 41 - 11 K.V. SUB STATIONS
STATE STREET
55 CIRCUIT MILES 16 K.V. DIST. 6 - 16 K.V. SUB STATIONS 2000 K.V.A. CONDENSER CAP.
SANTA BARBARA
444 CIRCUIT MILES 11 K.V. DIST. 6 - 11 K.V. SUB-STATIONS
LANCASTER
397 CIRCUIT MILES 11 K.V. DIST. 23 11 K.V. SUB STATIONS 5000 K.V.A. CONDENSER CAP.
LA HABRA
1 HYDRO ELECTRIC PLANT 2400 HORSE POWER 270 CIRCUIT MILES 16 AND 11 K.V. DIST. 14 16 AND 11 K.V. SUB-STATIONS 4000 K.V.A. CONDENSER CAP.
DALTON

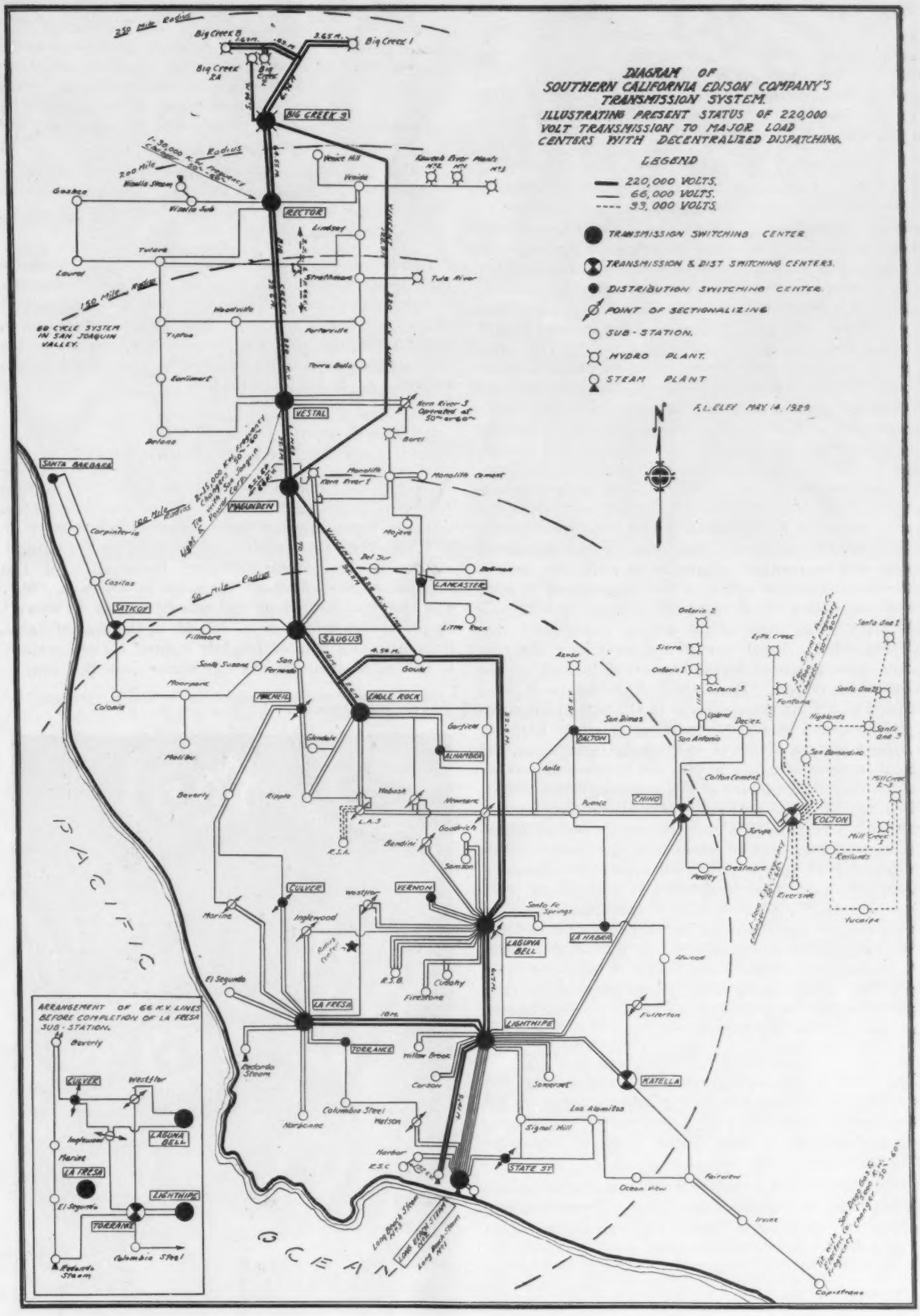


DIAGRAM OF
SOUTHERN CALIFORNIA EDISON COMPANY'S
TRANSMISSION SYSTEM.
ILLUSTRATING PRESENT STATUS OF 220,000
VOLT TRANSMISSION TO MAJOR LOAD
CENTERS WITH DECENTRALIZED DISPATCHING.
LEGEND
220,000 VOLTS.
66,000 VOLTS.
33,000 VOLTS.
TRANSMISSION SWITCHING CENTER
TRANSMISSION & DIST SWITCHING CENTERS.
DISTRIBUTION SWITCHING CENTER.
POINT OF SECTIONALIZING.
SUB-STATION.
HYDRO PLANT.
STEAM PLANT
F.L. ELEY MAY 14, 1929
N
ARRANGEMENT OF 66 K.V. LINES BEFORE COMPLETION OF LA FRESA SUB-STATION.
Big Creek B
Big Creek 1
Big Creek 2A
Big Creek 2
BIG CREEK 3
Venice Hill
Kern River #2
Kern River #3
Visalia Steam
Visalia Sub
RECTOR
Lindsay
Tulare
Laurel
Strathmore
Tule River
Woodville
Porterville
Tipton
Terra Bella
Earlimart
Delano
VESTAL
Kern River 3 Operated at 50 cycles
Borel
Kern River 1
Monolith
Monolith Cement
SANTA BARBARA
MAGUNDEN
Carpinteria
Casitas
Del Sur
Mojave
Rosamond
LANCASTER
Little Rock
VATICOY
Fillmore
SAUGUS
Santa Susana
San Fernando
Moorpark
Gould
Colonia
EAGLE ROCK
Malibu
Glendale
Garfield
ALHAMBRA
Beverly
Rimpau
Wabash
Newmark
L.A.3
R.S.A.
Bandini
Goodrich
Samson
Anita
DALTON
San Dimas
San Antonio
Upland
Ontario 2
Ontario 1
Ontario 3
Sierra
Azusa
Lytle Creek
Fontana
Deciez
Santa Ana 1
Santa Ana 2
Santa Ana 3
Highlands
San Bernardino
Colton Cement
Mill Creek #2
Mill Creek #1
Rialto
Puente
CHINO
COLTON
Jurupa
Pedley
Crestmore
Riverside
Yucaipa
CULVER
Westfir
VERNON
Marine
Inglewood
Santa Fe Springs
LAGUNA BELL
LA HABRA
Huntington Park
R.S.B.
Cudahy
Firestone
Slauson
Atwood
El Segundo
LA FRESA
LIGHTHIPE
Fullerton
TORRANCE
Willow Brook
Redondo Steam
Carson
Somerset
WATELLA
Columbia Steel
Watson
Los Alamitos
Harbor
R.S.C.
Signal Hill
STATE ST.
Ocean View
Fairview
Irvine
Long Beach Steam #2
Long Beach Steam #1
LONG BEACH STEAM
Capistrano
PACIFIC
OCEAN
Beverly
Culver
Westfir
Inglewood
Laguna Bell
Marine
La Fresa
El Segundo
Lighthipe
Torrance
Redondo Steam
Columbia Steel

responsibility for the successful operation invested in 24 groups. The central office supervisory dispatchers are responsible for the co-ordination of all dispatching operations in the switching centers, for load dispatching and for interconnections. At all times they are in a position to take over any or all operations during an extreme emergency which is beyond the jurisdiction of any one switching center.

Equipment, Preparation and Personnel

To carry out the necessary switching directly from the switching center in a systematic and safe manner required a great deal of preparatory work in grouping of lines and stations and in sectionalizing the system. The accompanying schematic diagram of the 220- and 66-kv. transmission systems shows the location of the various switching centers with relation to the 220-kv. "backbone" of the system which is continuous from Big Creek to Long Beach, a distance of approximately 275 miles. Also the sectionalizing points on the 66-kv. system are shown to indicate how they create six separate and distinct 66-kv. groups, each with one or more 66-kv. switching centers, and each with lines and stations grouped into a radial system instead of the original loop system. This is more clearly illustrated in the insert in the lower left-hand corner of the diagram, which shows the arrangement of lines and stations before and after the completion of La Fresa substation, the most recent 220/66-kv. distributing point. The existing communication system was rearranged to provide all switching centers with communication adequate for dispatching routine operations within their respective groups, and to provide main trunk lines to the central supervisory dispatching office. Local circuit and switching diagram boards were prepared for and mounted in each of the 24 switching centers. These show all the details of lines, switches and equipment involved in the particular group of stations, and also show sufficient detail of adjacent switching centers, points of overlapping jurisdiction and possible sources of power to give the operator-dispatcher a thoroughly clear picture of his operating set-up.

During the latter part of 1928 and the first part of 1929, over a period of six months, there were ten transmission switching centers established and these required the training of approximately 50 substation operators, station chiefs and their assistants, in dispatching problems. A majority of these men at one time or another during the past five years had had dispatching experience in distribution switching centers. With that experience as a background and with two weeks of intensive training in the central dispatching office, followed by close supervision in the switching centers, the change-over was most successfully carried out.

Conclusions

The decentralized method of dispatching is long past the experimental stage and during the past five years has demonstrated conclusively its effectiveness and advantages over centralized dispatching. Some of the major advantages are:

1. Provision for the most direct means of switching lines, issuing clearances, and carrying out routine and emergency dispatching operations over a territory of 55,000 square miles.

2. Makes possible the maintenance of service throughout the system in the event of loss of communication. The necessary switching operations are automatically carried out by the switching centers.

3. Elimination of all delay in restoring service following an interruption. All necessary operations are carried out directly from the switching centers in only the length of time required for the operator-dispatcher to make his observations and carry out the necessary switching.

4. Makes possible the simplifying of the company's communication system, removing loading from the lines and thereby giving better service on existing lines.

In addition to its effectiveness, decentralized dispatching is economical. In the reorganization two sub-dispatching offices were disecontinued, the personnel of the dispatching organization was reduced 50 per cent, and further, the additional responsibility placed on the substation operators has resulted in a more highly developed and efficient organization.

The Star of *Palawoo**

MARKING a high point in individual effort to take part in the outdoor Christmas lighting program in southern California last year was the star erected by F. B. Nightingale, manager of the lighting department of the General Electric Supply Corporation of Los Angeles, on the hill above his home in Altadena, Calif. The star was 35 ft. high and was lighted by 75 40-watt lamps. It shines high on the hillside at the head of Santa Rosa Avenue's mile of brightly lighted Indian deodars. It will shine again during Christmas week this year.

* *Palawoo*, an Indian name signifying bird's-nest; therefore the Nightingales' home.

Electrically Operated Apple Packing House at Odell, Ore.

This plant has an installation consisting of eight washers with a connected load of 51½ hp., eight graders with a load of 14 hp., and 12 hp. of conveying equipment in addition to general illumination

Power Costs of *Apple Packing*

THAT apples and pears were handled through the Hood River (Ore.) packing houses in 1928 at a power cost of 6 mills per box has been shown by an anaysis made by the Pacific Power & Light Company of 66 electrically equipped packing houses in the valley. This cost included the cost of power for washing, grading, and conveying the fruit, where power driven elevators or conveyors were used, as well as the cost of a substantial amount of electric light which has been found to be an essential factor in quick and accurate sorting and in general illumination in the packing houses. This cost is based on an average combined return of 3.96 cents per kw.-hr. The data obtained in the survey show the average number of packed boxes produced per kw.-hr. to be six and one-half.

The data from which these results were computed are complete in every respect and cover practically every apple-packing house served by the company in the valley, accounting for about 90 per cent of the 1928 crop of the district. These houses, some taking care of the crop of a single ranch and others handling cooperatively the crops of many growers, have loads varying from 1¼ hp. to 104¼ hp. The output of the plants listed ranges from 3,000 packed boxes to over 360,000. By far the largest number of the houses, however, operating one washer and one grader, have loads ranging between 5 and 13 hp. and put out between 10,000 and 50,000 packed boxes. Variation in the power cost per box runs from a high of about 3 cents down to about 17 cents, while the smallest number of boxes per kw.-hr. is 2.87 and the largest is 34.4 boxes.

The 66 apple-packing houses analyzed used 96 washers of seven different makes, and 108 graders of two makes, while 30 of them used varying amounts of conveying equipment having loads of from ¼ hp. to 22¾ hp. Other totals or averages of the entire group of 66 customers were shown to be as listed in Table I.

The detail of the data discloses a wide variation in average price per kw.hr., power cost per box, and boxes per kw.-hr. The average price per kw.-hr., which varies from 2.4 cents to 8.68 cents, is accounted for by the seasonal load factor of the installation, since the company's rates are such as to put a premium on high-load-factor operation. However, an attempt to analyze the reasons for the varying power costs per box leads to no certain conclusions. Some plants paying a relatively high rate per kw.-hr. produce their packs at a low power cost per box and *vice versa*. Further, the ratio of packed boxes to loose boxes handled apparently had very little bearing on the net results. The assumption must be, therefore, that the production of the pack at a low power cost depends in large part on the efficiency with which the packing house equipment is operated.

In order to show specifically what data were gathered

Table I—Data on Power Requirements of 66 Apple-Packing Houses

Total hp. of washers	697½
Total hp. of graders	118¼
Total hp. of conveyors	99
Total hp. washers, graders, conveyors	914¾
Power consumption	345,570 kw.-hr.
Total power billing	$11,840.51
Lighting consumption	95,627 kw.-hr.
Total lighting billing	$5,631.33
Total kw.-hr. consumption—lower and lighting	441,197 kw.-hr.
Total power and lighting billing	$17,471.84
Average cost per kw.-hr.—power	3.426 cents
Average cost per kw.-hr.—lighting	5.883 cents
Average cost per kw.-hr.—combined power and light	3.96 cents
Loose boxes of fruit handled	4,740,230
Total packed boxes	2,863,194
Average ratio packed to loose boxes	60%
Average electricity cost per box—power	0.4136 cent
Average electricity cost per box—lighting	0.1966 cent
Average combined power and light cost per box	0.6102 cent
Average boxes per kw.-hr.	6.489

from which the total and average results listed in Table I are obtained, the data on twelve installations are given in Table II, omitting only the power and lighting billings and a column showing the loose boxes handled. Eight of these twelve installations are picked because of some significant feature representing an extreme condition in the size of their loads or their packs, or their costs per kw.-hr. or per box, while four represent average loads and average packs. The data on these installations illustrate the variations in costs referred to above.

It is interesting to note from the foregoing table that the installation showing the lowest power cost per box (No. 39) paid a relatively high average rate per kw.-hr. On the other hand the installation paying the lowest price per kw.-hr. (No. 38) had a power cost of 7½ mills per box, or 1½ mills in excess of the average for the entire group, and produced only 3.16 boxes per kw.hr., or about half the group average. The most significant fact, however, as revealed by the survey, is that in no case does the power cost per box run sufficiently high to make it a major factor in the production of boxed apples for the market.

This fact is more firmly established by a comparison of the power cost with some of the other costs entering into the process. For instance, the cost data for 1928 of the Apple Growers' Association of Hood River, which handles a large proportion of the crop of the valley, showed that the cost of the box was 15½ cents. The paper for lining the box and wrapping the apples cost 10½ cents, while the average labor cost per box in the packing house was 16 cents. In this connection, likewise, is is interesting to note that the cost of the hydrochloric acid used in the washing process amounted to 0.35 cent per box, or only slightly less than the power cost for washing, grading and conveying.

The introduction of the requirement of the United States Department of Agriculture that arsenic from the spray used be eliminated from the surface of the apples has somewhat complicated the apple packing process. After experimenting in 1927 with different forms of wiping and washing equipment, the growers of the Hood River Valley generally adopted a type of washing machine that is produced by a number of manufacturers. These machines all employ some means of putting the apples through a bath of hydrochloric acid, and without attempting to describe the processes of the different makes or to discuss their relative merits, it can be said that all the makes in use in 1928 required the application of considerably more power than it had been necessary to use in the apple-packing process prior to that time.

Table II—Apple Packing House Power Data, Hood River, Ore.—1928

Account Reference	SIGNIFICANT FEATURE	Power Driven Equipment*	H.P. on Washers	H.P. on Graders	H.P. on Conveyors & Elevators	Total H.P.	Kw.-hr. Power	Kw.-hr. Lighting	Total Kw.-hr.	Av. Price per Kw.-hr.	Number Packed Boxes	Average Cost Per Box			Packed Boxes per Kw.-hr.
												Power	Lighting	Total	
1	Largest Load—Greatest No. Boxes	12W-12G-C	64½	17	22¾	104¼	39,120	14,740	53,860	$0.0327	361,645	$0.00300	$0.00186	$0.00486	6.71
54	Smallest Load	1W-1G	¾	½	....	1¼	296	310	606	.0683	4,000	.00426	.00608	.01034	6.60
65	Fewest Boxes—Highest Av., Cost per Kw.-hr.— Highest Av. Cost per Box	1W-1G	3	¾	....	3¾	473	570	1,043	.0868	3,000	.01447	.01573	.03020	2.87
38	Lowest Av. Cost per Kw.-hr.	3W-3G-C	28	3	15½	46½	38,480	4,747	43,227	.0240	136,900	.00573	.00185	.00758	3.16
25	Lowest Av. Cost per Box—Most Boxes per Kw.-hr.	1W-1G	2	1	....	3	760	430	1,190	.0584	40,970	.00088	.00081	.00169	34.4
39	Fewest Boxes per Kw.-hr.	2W-2G-C	18½	1½	7½	27½	22,391	6,595	28,986	.0285	72,138	.00671	.00475	.01146	2.49
47	Highest Ratio Packed to Loose Boxes—74%	1W-1G	5	½	....	5½	1,587	122	1,709	.0443	8,926	.00708	.00122	.00830	5.22
31	Lowest Ratio Packed to Loose Boxes—48%	1W-1G	10	¼	....	10¼	4,637	276	4,913	.0427	16,795	.00818	.00138	.00956	3.39
	Examples of Average Conditions														
57	Plant Having About Av. Load of 13.8 h.p.	2W-1G-C	12½	1	1	14½	2,417	1,949	4,366	.0782	51,600	.00407	.00254	.00661	11.81
63	Plant Packing About Av. Pack of 43,500 Boxes	1W-2G-C	10½	1¾	½	12¾	4,062	1,112	5,174	.0509	42,842	.00425	.00189	.00614	8.28
13	Large Pack With About 5-h.p. Load	1W-1G	4½	1	....	5½	1,860	1,058	2,918	.0430	36,392	.00194	.00150	.00344	12.47
52	Small Pack With About 5-h.p. Load	1W-1G	5	½	....	5½	1,663	316	1,979	.0442	10,000	.00689	.00186	.00875	5.05

*W - Washer; G - Grader; C - Conveyor.

From Table I it will be seen that the average load per washing machine was 7¼ hp. and that the additional load placed on the company's lines for apple washing was about 700 hp. This represented an increase in the load devoted to friut packing of over 300 per cent, necessitating a very considerable expansion of the distribution facilities of the company throughout the valley. Three-phase lines in place of single, and larger transformers and secondary capacities were necessary in many widely scattered localities throughout the district, and it is worthy of note that the necessary facilities were provided by the company in less than 60 days.

A factor bearing on the average rate per kilowatt-hour charged for the service is the short length of time the service is in use. Depending upon the size of the crop in general and on the amount of fruit handled by each house in particular, the apple-packing season lasts in the Hood River Valley from three to six weeks. It is evident that the sooner the process can be completed the lower the costs can be kept, even though the power costs for the shorter period of time will necessarily be higher on account of the low seasonal load factor. This fact simply emphasizes the relative unimportance to the grower of the power cost when considered as a part of the entire cost of producing the packed fruit.

The data presented in this article were gathered and compiled by Alva L. Day service salesman for the Pacific Power & Light Company in The Dalles-Hood River district.

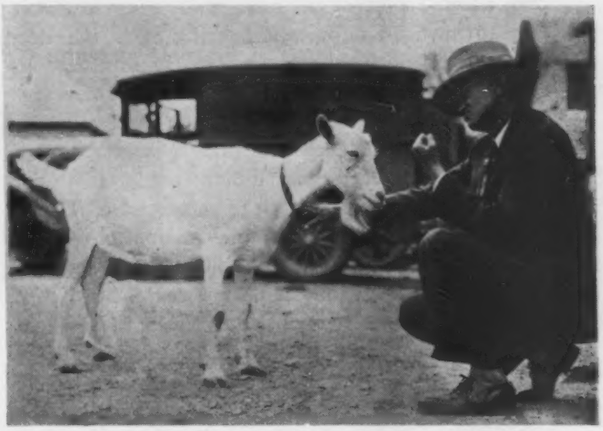
Hyacinth—

by Any Other Name

Being the Story of a Goat-Getting Campaign Related With Tears In His Voice

by

EDWIN H. HOOVER
Public Service Company of Colorado.



Hyacinth-etic expression and pose of Public Service Company of Colorado salesman on finding himself alone with his goat

HYACINTH is a sweet-sounding name whose mythical owner in dear, dead days, gazed upon her reflection in a pool of water and remarked: "What a good-looking egg am I!"—and magically became a flower which has since borne her name.

Since then, "Hyacinth" has suggested—to the mythological-minded—purling brooks, wildwoods and softly-scented meadows. But ask any Public Service Company of Colorado merchandise salesman, "Who was Hyacinth?" and you will hear the plaintive bleat: "Hyacinth is a goat with no manners and a beard." Ask any one of half a dozen Denver taxicab drivers the same question and he will reply as follows: "!*?—&."

But inquire of Chris. A. Bigler, superintendent of the Public Service Company's domestic gas division, and he will grin: "Hyacinth is the greatest sales-inspiration I have ever known."

That gas water heaters featured the campaign wherein Hyacinth did her inspiring is incidental. If the sales-commodity had been electric refrigerators, radios, incandescent lamps, toothpicks or telephone poles, Hyacinth would still have inspired the making of a new world's record. The boys in Mr. Bigler's department sold six hundred water heaters in six weeks—an achievement said to be unparalleled. They would have sold steppes to Siberians or igloos to Indians if by so doing they evaded custody of Hyacinth.

The situation reversed the time-honored truism: "To the victor belongs the spoils," for Hyacinth, despite her affectionate disposition and neighborly habit of borrowing tailored tidbits from salesmen's pants, was distinctly in bad odor as a prize. Hence she became, at the end of each working week, the temporary property of whichever was low among four competing teams. Low man on the losing team was promptly awarded custodianship (that's where the word acquired its "cus") of the "prize"; and he was required to brush, manicure, feed, exercise and otherwise wait upon the nanny-goat until, by feats of salesmanship, he won freedom from his incubus.

Be it said, no man twice had charge of Hyacinth. Salesmen sold—and sold. Hours meant nothing to them, until prospects went to bed. They were thinking of Hyacinth.

At first Hyacinth changed masters each day, and taxicab rides from the office to the losing salesman's home were part of the enforced program. But domestic relationship rapidly weakened under the strain and Hyacinth, thereafter, was tethered on the Public Service Company's loading dock, bedded copiously with straw and furnished with unlimited fodder. There she submitted gladly to daily beauty ministrations from hands that yearned to choke her, and copious applications of perfume.

Around the Public Service Company of Colorado when sales managers threaten their crews with Chris. Bigler's Hyacinth-etic methods of butting into higher sales brackets, there is something "goatesque" in the immediate sales-response.

Electrical West

C. T. Hutchinson, *Editorial Director*
G. C. Tenney, *Managing Editor*

Natural Gas and the Electrical Industry

STRICT enforcement of California's recently enacted natural gas conservation law promises to have an important bearing upon the electrical industry of that state. By prohibiting unreasonable waste of natural gas the law makes future oil production contingent upon disposal by storage, use or sale of a natural gas crop of approximately twenty-nine billion cubic feet per month which is now wasting to asmosphere. Translated into terms of power, this amount of gas is equivalent to the output of a 6,000,000-kw. steam-electric plant operating at 65 per cent load factor. Such a plant could supply four times the present combined peak requirements of all California utilities.

Briefly, administration of the law promises an economic readjustment that will affect the electrical industry materially. Natural gas will be cheaper, for oil companies must dispose of it without waste in order to produce oil. Cheaper gas for fuel will mean that future power development will be almost exclusively steam. Hydro stations cannot be expected to compete with steam-generated energy costing from 2 to 4 mills per kilowatt-hour. Present steam plants are now using approximately 100,000,000 cu.ft. of gas per day, and stations now under construction will almost double this figure.

Cheap natural gas for fuel makes doubtful the economic value of the power to be developed at the proposed Boulder Canyon Dam. Paradoxical as it may seem, steam-generated power might be delivered from southern California to Boulder Dam and sold at the bus bar cost of energy from the Colorado River plant. What prospect has Boulder Canyon power of competing with steam-power under these conditions?

Cheap natural gas and the added sales effort that is being manifested in finding a market for this resource will mean added competition for electricity in domestic cooking, water heating and house heating, in industrial heating, building heating and in other fields. The progress of the electrical industry may be momentarily retarded in these rapidly growing markets for electricity.

But there are compensating factors. Cheap natural gas will attract industries. These will be large users of electric power. Industries will bring population increases, and more people will mean more domestic consumers. Finally, cheaper natural gas for fuel in steam plants will mean lower electric rates, and lower electric rates are invariably followed by marked increases in consumption.

By and large, the electrical industry in California need not fear the added competition that natural gas promises. At worst, it can mean only a slightly added sales burden to an industry that is already sales conscious.

Water Shortage Seriously Affects Seattle and Tacoma

DEFICIENT rainfall and drought throughout the country as a whole have placed unusual dependence upon steam plants for power during the past summer and fall. Nowhere, however, is the situation more serious than in the Pacific Northwest. Particularly is this true with the municipal systems of Seattle and Tacoma.

Both rely largely upon hydro-electric stations for energy, although the Seattle system includes a 30,000-kw. steam standby plant. In Tacoma, during the past fortnight, the water shortage became so acute that some customers were cut off and a program of rationing power was adopted. In addition, a plea was made to the Navy Department to place the *U.S.S. Lexington*, with its 140,000-kw. in turbo-generators, at the disposal of the municipalities to make up the deficiency in power and carry the system over until rain relieved the situation. This the Navy is reluctant to do.

The situation in Seattle and Tacoma points a strong moral to both municipal and private utilities. Under all but extraordinary conditions steam standby is necessary in conjunction with hydro plants to assure continuity and reliability of service. Particularly in the West, where rainfall records seldom extend back farther than 75 years, must standby plants be provided to guarantee adequate service. Private utilities in California have learned this lesson during the past five years and have built in excess of 700,000 hp. in steam plants during that time.

In the Northwest, too, private utilities have been awake to the situation. The Puget Sound Power & Light Company, operating in the same territory as the Seattle and Tacoma systems, installed a 40,000-kw. steam unit during 1929 and will have a second unit of the same capacity in service by June, 1930. In the meantime the municipal utili-

ties have placed their reliance chiefly on hydro plants, hoping that adequate water to operate them would be available.

Little relief appears to be in sight. Such precipitation as occurs from now on will likely be in the form of snow, and hence not available until the run-offs next spring and summer. At best, it appears that Seattle and Tacoma must rely upon the efficacy of prayer—and pray for warm rains.

Stock Market Upset Will Not Affect Western Conditions

NO DIMINUTION in engineering construction in the Pacific Coast states will result from October's near panic in the stock market. On the other hand, a canvass of public utilities, state agencies, engineers and others, printed on another page of this issue, shows scheduled construction programs for 1930 considerably greater than the average for the past few years.

In the Pacific Northwest power companies will expend more money in 1930 than in 1929. The Pacific Gas and Electric Company announces a $35,000,000 program of construction. A $5,000,000 increase in budget is planned by the Southern California Edison Company with a $23,000,000 program. Railroads, highway commissions, reclamation districts and others show equally large increases.

In so far as the electrical industry is concerned, business will be good in 1930. If the huge deflation of market values in securities has shaken the confidence of anyone, it is not apparent. Rather, a distinct feeling of optimism prevails.

State Regulation Is Adequate

THE tide of disapproval against the proposed Couzens Bill with its provisions for federal regulation of communication and power companies continues to rise in the Western states as the revolutionary features of the measure are studied. Public utility commissions and governors have recently expressed distinct opposition to the usurpation of states' rights that the bill threatens.

Objections chiefly center around two points: the expansion of federal authority in a field where state commissions are now functioning adequately, and the blow to state sovereignty that federal regulation of utilities portends.

The Couzens Bill proposes to extend to communication and power companies the regulatory system applied to railroads. The cases are not parallel. Eighty-five per cent of railroad business is interstate; only 1.3 per cent of the telephone and 10 per cent of the power business is conducted across state lines. In the first instance federal regulation is essential; in the second there are no problems presented that cannot be met by existing machinery set up by the states themselves.

Present Senatorial interest in federal regulation is probably traceable to recent mergers, activities of the holding companies and, in the case of the light and power industry, to the findings of the Federal Trade Commission. However, there is no indication that state regulation has failed in its original purpose or that it will not be able to cope with these more recent developments. Until such a time as state commissions show dereliction of duty or inability to enforce regulation in the public interests, Senators will do well to observe a hands-off policy. In the light of present conditions, the advocacy of federal regulation is both premature and presumptive.

Architects Recognize a Sound Wiring Plan

RESPONSE is a good barometer of acceptance. Measured by that standard, the response to a general letter to architects offering copies of the new Red Seal commercial building specifications shows beyond doubt that the electrical industry at last has extended to architects something for which they have long felt a need. Of 340 architects in northern California, notified of the new wiring standards by letter only, 169, or 50 per cent, voluntarily requested copies.

In this connection, the experience of a large manufacturer with this same group of architects will show how strongly they feel on the subject. A letter was sent them offering a booklet of engineering information which, in view of the data presented, should have received similar response. Yet only ten of these architects, instead of 169, answered the manufacturer.

That architects are beginning to realize the value of the California Electrical Bureau's noncommercial Red Seal activity is proved by fresh evidence almost every day. The text of a specification requirement written into the plans by a Petaluma architect, and reported in another part of this magazine, is a concrete example.

Winning its way thus into the offices of those who plan new buildings, the Red Seal Plan, both for residential and commercial structures, bids fair to do what salesmen for the individual companies in the industry often have failed to do—gain acceptance for adequate wiring of a high quality.

Engineering Practice

Forecasting the Trend of Electric Power Demand*

Study of Commodity Prices Yields Novel Index From Which Expected Future Activities in Electric Utility Field May Be Predicted

By WALTER J. HERMANN, Statistician, S. W. Straus & Company, San Francisco.

KNOWLEDGE is power and power in this case means kilowatt-hours available in the right place at the right time and in the proper quantity. To avoid the cyclic expedition and recurring retardation of system expansion and yet to meet adequately a growing power demand is one of the major problems facing the electric utility engineer and executive. A "barometer" which would give a basis of demand prediction other than those presented by load curves and population studies should be of definite service to those charged with such responsibilities or interested in the expected growth of electric utilities. A determined quest for such a barometer led to accumulation of the information presented in this article which is offered as a contribution toward the desired end.

Out of research involving the usual run of business barometers — money costs, bond yields, car loadings, pig-iron prices and production, and other similar items—coke prices appeared to give more consistent and useful results than any of the others. It also was found that the variation in coke prices occurred considerably sooner than the corresponding variations in power production so that it was possible to forecast approximately two years in advance with a high degree of accuracy.

The case seems to stand analysis, too. Coke is a necessary element in the manufacture of innumerable fundamentals and its price always is a sure indicator of production volume, particularly in the steel industry, through which a relationship may readily be traced to the electrical industry. For example, take the case of a new business building in the course of erection. The steel for that structure was rolled perhaps ten months before and the coke used in the reduction of the raw materials was purchased probably as much as fourteen months before the building began to take shape. Further, it is obvious that within another ten or twelve months the building in question will be occupied and a corresponding increased demand for kilowatt-hours will be registered by the power company serving that area. This situation repeated thousands of times and all over the country is found to give a remarkably stable relationship, as illustrated in the accompanying charts.

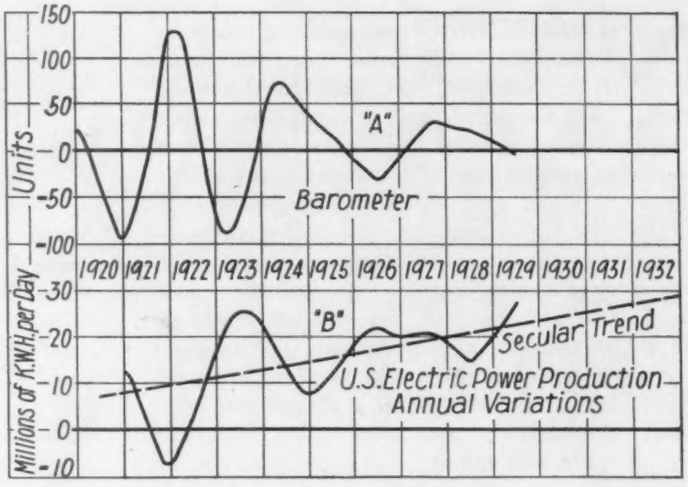


Fig. 1. Curve showing annual variations in electric power production in the United States (*below*) and the fundamental barometer curve (*above*)

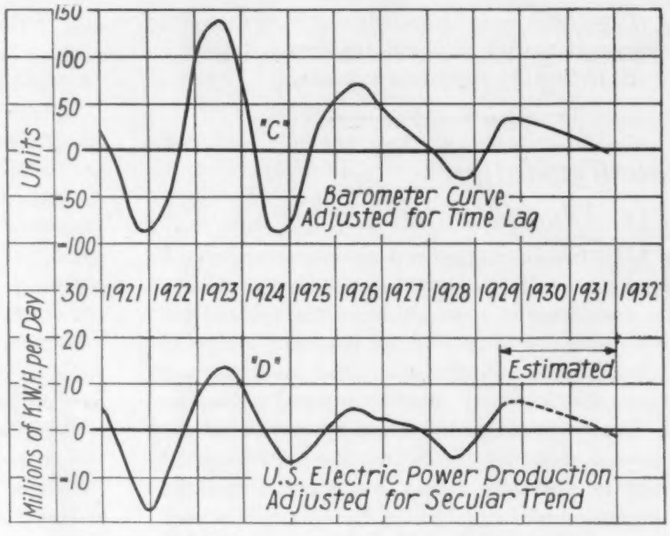


Fig. 2. Adjusted barometer and power production curves.

Method of Procedure

Referring to Fig 1, curve A, the fundamental barometer is derived directly from the price of coke at the Connellsville, Pa., furnace. The figures from which the curve is plotted are not actual coke prices, but are obtained through a combination of mathematical steps designed to correct the data for seasonal and other variations. Briefly stated, the curve as shown is the in-

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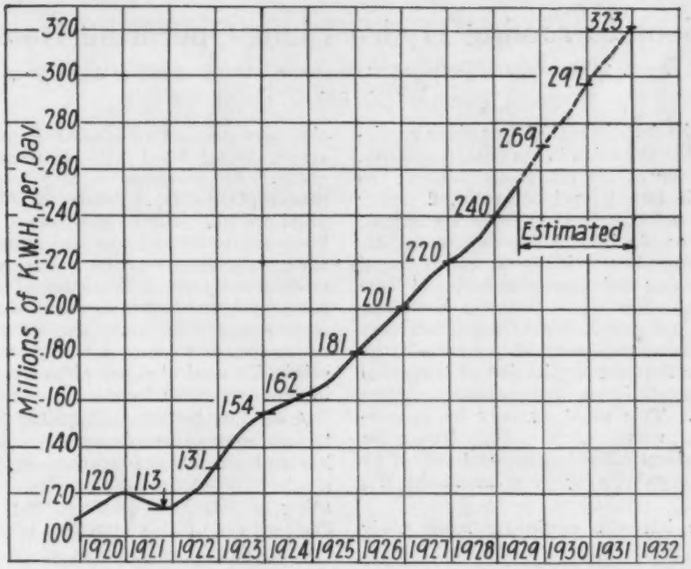


Fig. 3. Application of prediction methods expressed in expected total United States electric power production, actual figures, 1929-28 and estimated for 1929-31

verted annual derivative of the 12-month moving average expressed as the percentage of the moving average price. Curve B is a month-to-month record of the annual variation in the 12-month moving average of total. U. S. electric power production. The unit of production is taken as the daily average output in each month. A casual examination of these two curves indicates that the relationship between them is more than a coincidence and that either one is a function of the other, or both are functions of some third variable. As an actual matter of fact, after adjusting each of the curves for certain simple factors, it can be shown that the two are almost identical.

The first and most obvious adjustment is in connection with the time interval between the two. It was noted, for example, that the 1920-21 depression in the production curve lagged the index curve about twelve months, that the 1922-23 peak lagged about sixteen months and that the 1923-24 depression was about twenty months behind the corresponding depression in the barometer curves. It is apparent, therefore, that the time interval has been increasing until, at the present writing, the lag is approximately 26 months. It also is evident that the lag, although increasing, is doing so at a decreasing rate. The first step, therefore, was to obtain a reasonably accurate chart of this time interval, and to adjust the barometer curve accordingly. Curve C, Fig. 2, has been corrected in this manner.

The second obvious adjustment is in connection with the secular increase of the electric production curve. In other words, it appears that the production curve is subject not only to what we may call secondary variations, but that on the average it also is experiencing a fairly steady increase from year to year. This growth is illustrated graphically by the dotted line shown passing through the central axis of curve B, Fig. 1. Curve D, Fig. 2, was obtained by replotting curve B about this secular trend as a base line.

The results of these adjustments make it quite clear that the two curves are very definitely related to each other and that because of the considerable difference in time between them, curve C becomes a very excellent barometer or index for curve D, from which, in combination with the secular trend, the actual production figures may easily be computed.

It is probable that if a detailed mathematical study of the relations between the two sets of data were made, very accurate forecasts could be obtained, but for purposes of general information it was considered that a graphical analysis would be sufficiently accurate. The estimated portion of the production curve therefore was drawn in by eye (dotted portion of curve D) to correspond with the variations of the barometer.

To convert this graph into actual kw.-hr. is a simple procedure. We must first remember that the deviation shown in curve D really expresses deviation from the normal secular trend, so that the figures shown on this curve must be algebraically added to the corresponding figures shown for the secular trend at the same date. This calculation is set forth in Table I.

As stated above, the figures in the last column represent the annual variations in the 12-month moving average of electric power production in the United States. To obtain the total production for any 12-month period ending at any given date, it therefore is necessary only to add the above figures to the preceding 12-month total. This calculation is shown in Table II and the figures appear in graphical form in Fig. 3.

Thus it appears that since the annual production for the 12-month period ending Dec. 31, 1928, was at the rate of 240,000,000 kw.-hr. per day and that since the combined secular and secondary increases are estimated at 29,500,000 kw.-hr. the average daily output for 1929 will be in the neighborhood of 269,500,000 kw.-hr. In like manner, the daily average production for the year ending, December, 1930, is estimated at 297,000,000 kw.-hr., etc., through December, 1931, for which year

TABLE I

Date	Variation from Secular Trend	Secular Trend	Algebraic Total
	Millions of Kw.-hr. Per Day		
December, 1929	6.0	23.5	29.5
June, 1930	4.5	24.0	28.5
December, 1930	3.0	25.0	28.0
June, 1931	1.0	26.0	27.0
December, 1931	—1.0	27.0	26.0

TABLE II

	Previous 12 Months	Combined Variation	Current 12 Months
	Millions of Kw.-hr Per Day		
December, 1929	240.0	29.5	269.5
June, 1930	254.0	28.5	282.5
December, 1930	269.5	28.0	297.5
June, 1931	282.5	27.0	309.5
December, 1931	297.5	26.0	323.5

TABLE III

Year	Theoretical Production based on 12% annual increase	Actual Production 1921-28; Estimated 1929-31.
	Millions of Kw.-hr. Per Day	
1921	113.0	113
1922	126.5	131
1923	141.5	154
1924	158.5	162
1925	177.5	181
1926	199.0	201
1927	223.0	220
1928	250.0	240
1929	280.0	269
1930	313.0	297
1931	362.0	323

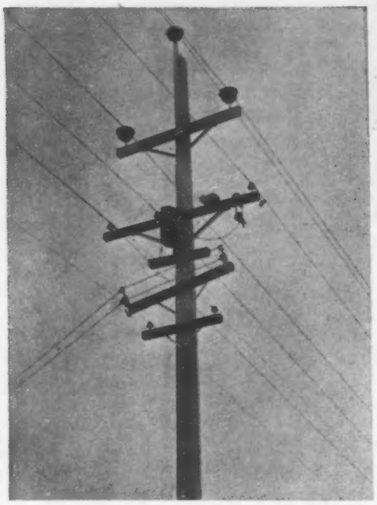
an estimate of 323,000,000 kw.-hr. per day is indicated.

It is interesting to note that although these estimates indicate a large numerical increase over recent years, they are considerably lower than the generally accepted annual compound rate of increase of approximately 12 per cent which has occurred for several years past. This is apparent from Table III, which shows in the first column a calculated annual increment of 12 per cent and in the second column the actual and estimated production figures from 1921 to 1931, inclusive.

Therefore it may be seen that although the electrical industry as a whole has a promise of large added loads, much in excess of any annual additions in the past, the rate of growth can be expected to diminish quite perceptibly. This precludes the use of fixed percentages, of course.

Attention also should be called to the fact that although the production may vary somewhat in different sections of the country it has been noted generally that certain sections either precede or fall behind the country as a whole by a few months. With the above data at hand, therefore, it is simple for a given utility to compare its output with that of the country at large and to judge its own future accordingly.

Rural Line Construction Near Klamath Falls



AN example of combination transmission and distribution construction such as is used in certain rural areas by The California Oregon Power Company is shown in the accompanying illustration. Service for a rural customer is supplied by means of the 11-kv. transformer mounted at the 11-kv. crossarm. The pole carries also a 60-kv. transmission line and a communication circuit. It may be noted also that a domestic cat is composedly resting on the 11-kv. crossarm although officially not part of the installation.

Sound-Proofing Hydro Plant Operating Room

By C. M. ALLEN, Junior Electrical Engineer, Bureau of Power and Light, City of Los Angeles

SOUND-PROOFING was given particular attention in the design and construction of the operating room at the rebuilt San Francisquito No. 2 power plant of the Los Angeles Bureau of Power and Light. A few features of design together with liberal use of sound deadening and absorbing material have proved effective in reducing the noise level in the switchboard room to a very satisfactory degree. It is believed that this is the first application of acoustical treatment in a hydro-electric power plant. This plant, it may be remembered, was reconstructed from the ground up following its destruction by the overwhelming flood of March 13, 1928.

The bureau's engineers made their first attempt to minimize noise trouble by starting in at the source of the noise disturbance. Machine and building foundations originally were built as independent structures. The new generator room floor is carried on beams and the only contact with the machine foundations is through a mastic expansion joint. All major auxiliary equipment also is isolated by means of mastic joints. This design reduces appreciably the percentage of vibration noise set up by the rotating machines that may be carried into and through the building frame. Noises otherwise transmitted and produced by auxiliary equipment have not proved to be of a serious or objectionable nature.

In the operating room itself it was particularly desired that noise effects be reduced to a minimum and to accomplish the desired effect several means have been resorted to. Walls of the operating room on the generator-room side are of hollow construction, the center being filled with diatomaceous earth. All windows in this wall are double plate glass. Deadening felt applied to the ceiling and heavy ¼-in. linoleum to the floors has improved materially the acoustic qualities of the switchboard room. The use of ebony asbestos switchboard panels in the construction of the new operating and meter boards in lieu of slate panels as originally used also has played its part in reducing noise troubles.

A completely indirect lighting installation together with a special ventilating and air filtering system completes a nearly ideal operating room. Operating results have reflected the beneficial effects of this attention to detail.

Turbine room of rebuilt San Francisquito No. 2 plant. Operating room, at the upper right, specially sound-proofed.

Steam Unit Shows Fine Operating Record

Unit No. 10 at Long Beach No. 3 steam-electric plant of the Southern California Edison Company completed 497 days of service on Nov. 1, 1929. During this period the machine was actually in operation 10,165 hours out of a possible total of 11,928. The 1,763 hours outage time included preliminary operation while the unit was being "tuned up" when first placed in service. This outage period also included "time out" for the annual inspection and for a minor repair job which required the turbine to be out of service for two weeks.

Starting Dec. 29, 1928, the unit operated continuously at or above full load until April 1, 1929, 2,241 hours. The unit has averaged 117,500 hp. for the first ten months of 1929, and 112,000 hp. during its service life.

Fundamentals of Correct Metering—IV

Blondel's Theorem as Applied to the Metering of a Five-Wire Circuit With a Star-Connected Load

By E. C. GOODALE, Tacoma, Washington.

BLONDEL'S theorem and the manner in which it operates in connection with metering problems was discussed in the early articles of this series. Specific application of this theorem to the case of a five-wire interconnected system of any phase, any voltage unbalance and "mesh"-connected loads of any power factor or unbalance was treated in the form of a typical example in the article immediately preceding. This same five-wire problem except with star-connected loads is taken up next. Fig. 9 shows the same source and same meters, but with a star loading.

These star loads could have been combined vectorially with the mesh loads previously discussed and the power components of the resultants with respect to the meter voltages determined, but it would have complicated unnecessarily the diagrams.

Consequently their discussion is taken up separately. A typical star load is one with a common center, as at O in Fig. 9.

With an isolated-neutral star load as shown, the exact location on the vector polygon diagram of the point O really depends upon the impedances of the connected loads as well as upon the values of the line voltages and their phase relations. Given these impedances it would be possible, by solving a set of simultaneous equations involving the line voltages and these impedances and derived from application of Kirchoff's laws to the circuit, to find the vector position of point O.

It is simpler, for purposes of illustration, however, to select a plausible case since we are interested only in assuming certain data and applying Kirchoff's laws or their modifications to the remainder.

First, then, it is possible for the point O to lie practically anywhere desired. Hence assume that it is at the point shown in Fig. 10A. Then the line-to-neutral voltages E_{aa}; E_{bb}; E_{cc}; E_{dd}; and E_{ee} are determined easily by drawing in the straight lines from O to point AA, BB, CC, DD, and EE. To see if these values agree with Kirchoff's voltage law, start on conductor E and progress to the other conductors each in turn, first by the direct route across lines and then by way of the star loads.

E_a, from E to A by direct path should equal the value obtained in going by way of E-EE-O-AA-A, that is, should equal $E_{ee} + E_{aa}$. Fig. 9 shows what "should be" and Fig. 10A shows that it is true, for in passing from point EE to point O we are with voltage E_{ee} and from O to AA we are with E_{aa}; hence E_a equals $E_{ee} + E_{aa}$.

The remaining values of the meter voltages have been taken from Fig. 6C* and dotted in on Fig. 10A. Thus it may be seen also that E_b is equal to $E_{ee} + E_{bb}$. Likewise $E_c = E_{ee} + E_{cc}$. Also E_d is the vector sum of $E_{ee} + E_{dd}$.

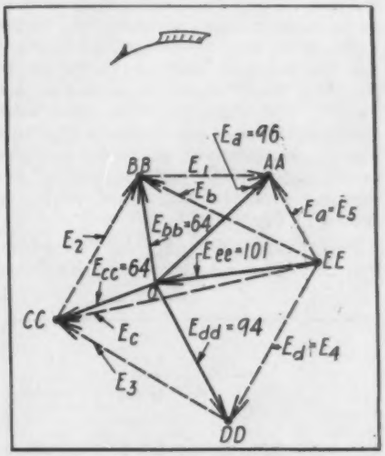


Fig. 10A. Diagram showing derivation of unknown voltages from vector polygon of known voltages, assuming location of "O" to be known. Note that $E_a = E_{ee} + E_{aa}$; $E_b = E_{cc} + E_{bb}$; $E_c = E_{ee} + E_{cc}$; and $E_d = E_{ee} + E_{dd}$.

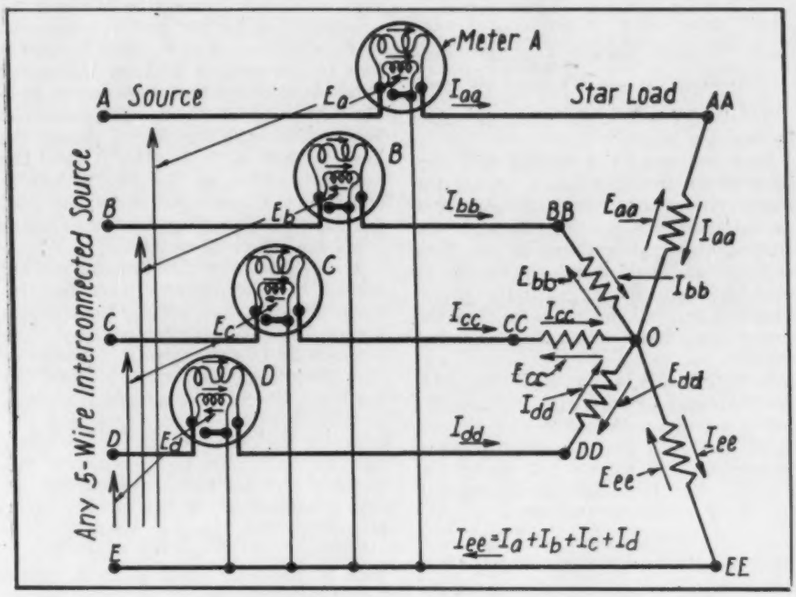


Fig. 9. A metering connection for any five-wire interconnected star system that will give correct registration regardless of voltage or load unbalance or load power factor. Note that the upper arrow in each meter denotes the direction of current for registration; the center arrow, potential-coil exciting current; and the lower arrow, potential-coil voltage drop. Note also that solid-headed arrows on lines indicate "positive" direction of load current through meters; solid-headed arrows on loads indicate same for loads; open-headed arrows on loads indicate assumed direction of voltage drops across loads.

Having now a set of load voltages which comply with Kirchoff's law and hence which represent a possible case, they are plotted in a radial diagram, Fig. 10B, to show the phase relations between them.

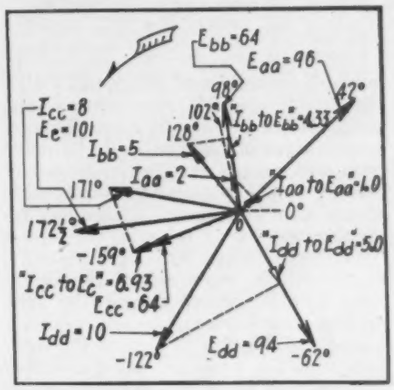


Fig. 10B. Determination of true power to star loads, except load EE, assuming that neutral point "O" is known. Total power amounts to 1,286 watts. See Table II for related values.

Then assume a set of load currents which also must represent a possible case. Since these currents must satisfy Kirchoff's current law that the sum of the currents entering a junction point must equal the sum of those leaving, and since in Fig. 5* I_{aa}, I_{bb}, I_{cc}, and I_{dd} were assumed as entering point O and

* See Article III, page 241, ELECTRICAL WEST, Nov. 1, 1929.

TABLE II—Data pertaining to vector diagram of Fig. 10B.

Current.	Power Component.	Power Taken by
I_{aa} leads E_{aa} by 60 deg.	"I_{aa} to E_{aa}" = 1.00 amp.	Load AA = 96 × 1.00 = 96 watts
I_{bb} leads E_{bb} by 30 deg.	"I_{bb} to E_{bb}" = 4.33 amp.	Load BB = 64 × 4.33 = 277 watts
I_{cc} lags E_{cc} by 30 deg.	"I_{cc} to E_{cc}" = 6.93 amp.	Load CC = 64 × 6.93 = 443 watts
I_{dd} lags E_{dd} by 60 deg.	"I_{dd} to E_{dd}" = 5.00 amp.	Load DD = 94 × 5.00 = 470 watts
		Total = 1,286 watts

only I_{oo} as leaving it, it is obvious that $I_{aa} + I_b + I_c + I_d$ must be vectorially equal to I_{oo}. That is, if any desired values are assumed for the first four currents, then by arranging their vectors in a heel-and-toe manner the vector value of I_{oo} may be determined by closing the polygon starting vector I_{oo} at the first "heel" and ending at the last "toe." The values of the first four currents assumed are shown in Fig. 10B and the formation of the vector polygon by closing in the remaining side to determine what I_{oo} will have to be is shown in Fig. 10C.

Vector polygons may be formed in this way whenever there are equations

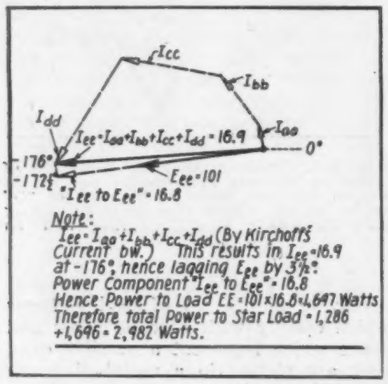


Fig. 10C. Determination of power to load EE (this being the load from the common metering conductor to the neutral point "O")

in which both sides of the equality sign contain terms all representing the same kind of vector quantity. For example, a vector polygon could be made from any voltage equation or from any current equation applying to quantities of the same frequency. (Since any irregular wave may be analyzed into a fundamental wave and its harmonics, values which were not pure fundamental values would have to be split up into their harmonics, each requiring a separate diagram of vectors, the third harmonic, for example, being assumed to rotate at three times the speed of the fundamental vector, etc.)

The current values which are assumed for the star load examples are:

I_{aa} = 2 amp. 60 deg. leading E_{aa}.
I_{bb} = 5 amp. 30 deg. leading E_{bb}.
I_{cc} = 8 amp. 30 deg. lagging E_{cc}.
I_{dd} = 10 amp. 60 deg. lagging E_{dd}.

Figure 10B shows each vector plotted to scale at the proper angle leading or lagging its corresponding voltage. Fig. 10C then shows the determination of the remaining current, I_{oo}. It is found to be 16.9 amp. and at an angle of –176 deg. to the positive horizontal. Voltage E_{oo} lies at an angle of –172.5 deg. Hence they happen to come out nearly in phase with each other. That is, the fifth load EE would, in this case, be an almost pure resistance load.

The value of the power component of each current with respect to its corresponding voltage is shown in Figs. 10B and 10C. Multiplying each by its voltage gives the power taken by these loads:

Load	AA	takes	96 × 1.00 =	96	watts
Load	BB	takes	64 × 4.33 =	277	watts
Load	CC	takes	64 × 6.93 =	443	watts
Load	DD	takes	94 × 5.00 =	470	watts
Load	EE	takes	101 × 16.8 =	1,696	watts
Total				2,982	watts

Total of 2,982 watts, then, is taken by the star loads.

Now see what the meters will register under the star loads. Since the star currents themselves are the same as the currents passing through the meters, the registrations on the four meters can be determined easily by working each current with the corresponding meter voltage and noting the power component with respect to that voltage.

In Fig. 11 this is shown. In Fig. 11A the current I_a works with voltage E_{aa} giving a power component with respect to it of 1.9 amp. The registration, therefore, is 59 × 1.9 = 112 watts. In a similar way the other meters register as shown in the illustration:

Meter A	59 × 1.90 =	112	watts
Meter B	121 × 4.48 =	542	watts
Meter C	163 × 7.47 =	1,219	watts
Meter D	111 × 9.99 =	1,109	watts
Total		2,982	watts

Consequently, it is evident that Blondel's theorem gives correct metering regardless of balance of conditions, regardless of power factor of the load, and regardless whether mesh or star-connected or even a combination of the two, as may be proved easily by assuming any possible values of loading desired, and working out first the true power at the load and then the power registered on the meters. Of course the more complicated the load connection the more difficult it is to determine the true values and correct phase positions of all the elements of the load for a representative example.

The reason why Blondel's theorem correctly registers the mesh loads is due to the fact that each load draws its current in a "forward" direction through one meter and in a "reverse" direction through a second meter. It may be found, by referring to Fig. 5, that the vector resultant of the voltage of the meter through which the load current in question passes in a foreward direction, minus the voltage of the meter through which it passes in a reverse direction, is equal to the voltage of the load itself.

For example, load 1 draws a current forward through meter A but passes it back through meter B. Hence the registration is equal to the product of the current I_1 by the power component of E_a with respect to I_1 minus the product of I_1 by the power compenent of E_b with respect to I_1. This is equivalent to the product of I_1 by the power component of the vector difference, E_a—E_b with respect to I_1, and since the vector difference E_a—E_b is equal to the load voltage E_1 it is evident that the net registration on the two meters is equal to the power taken by the load 1. In a similar way the other mesh loads are correctly metered.

The reason why this theorem proves correct in metering star loads is a bit more difficult but yields to analysis after a little study. Each meter voltage is made up of two parts, (1) the common line-to-neutral voltage E_{oo} and (2) the load voltage corresponding to that meter's current. Hence there is registered on the meter what may be called its own load, plus the product of the common voltage E_{oo} multiplied by the power component of its current with respect to this common voltage.

This occurs in each meter. Hence each of the four main loads is registered, plus the sum of the products of the power components of these currents (with respect to the common voltage) multiplied by the common voltage. But this latter part is equivalent to the vector sum of these currents with re-

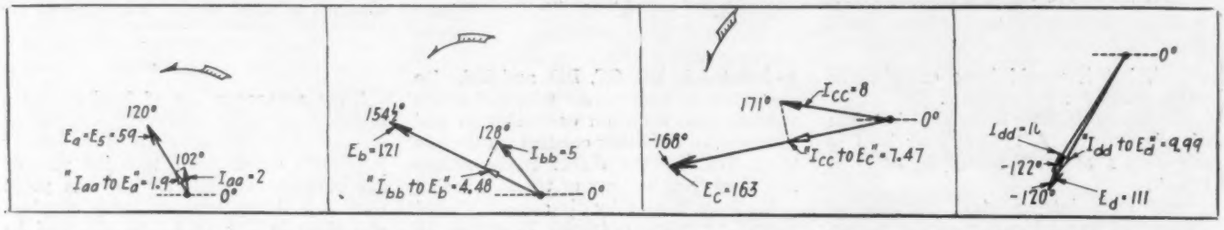


Fig. 11A. Power registered on meter A. 59 × 1.92 = 112 watts.

Fig. 11B. Power registered on meter B. 112 × 4.48 = 542 watts.

Fig. 11C. Power registered on meter C. 163 × 7.47 = 1,219 watts.

Fig. 11D. Power registered on meter D. 111 × 9.99 = 1,109 watts.

Total power registered on all four meters amounts to 2,982 watts.

spect to E_{oo} multiplied by E_{o} and hence equals I_{oo} with respect to E_{o} times E_{oo}, and this is the true power taken by the EE load. That is, each meter registers its own load plus its part of the common load. Meter A for example registers: ("I_{aa} to E_{a}") $\times$ E_{a}. This equals ("I_{aa} to E_{aa}") $\times$ E_{aa} + ("I_{aa} to E_{oo}") $\times$ E_{oo}. The same holds true for the other meters. The sum of the first terms gives the true power taken by the four main loads and the sum of the last terms gives the power taken by the common load, EE.

When the neutral point of the star loads is tied back with the source it makes one more meter necessary since the system then has one more conductor, whether earth or metallic. By choosing the neutral for the common conductor, as is common practice, particularly in three-phase four-wire systems, each meter measures its own star load only, there being no common load such as load EE in the preceding illustration, unless one were to consider the resistance of the earth return as a common load of very low voltage. It would of course be metered, the registration taking care of the loss of power in the neutral, on the load side of the meters.

Blondel's theorem well may be taken as the criterion of correct electric metering.

EDITOR'S NOTE: This is the fourth and last of a series of articles prepared by the author discussing the application of Blondel's theorem to various metering problems and giving an explanation of certain basic underlying principles.

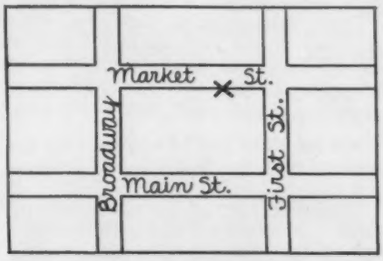
It Pays to Ground Lines Before Going to Work

On a certain utility property a line crew asked for clearance on a 22-kv. line. Accordingly, a railway substation operator was instructed to open a certain pole-top switch in order to clear the line. The switch was thrown and locked in the open position, and so reported, but when the line crew pulled a ground chain across the line the rope attached to the chain began to smoke the moment it struck the center phase of the line. Being on the alert, the foreman of the crew made a trip to the substation where he found that the switch in question had been opened, but that the center blade casting was broken, resulting in the center phase being left "hot."

This is suitable emphasis that it pays to ground lines before working on them. Comment has come in to the effect that the grounding of transmission lines is quite generally practiced throughout the electrical industry but the question is raised, "What about distribution circuits?" There seems to be a difference of opinion as to the desirability of protective grounds on primary feeders that are "killed" for repair work. The question is raised, however, that there is just as much chance for error in switching or failure of switching equipment on a 2.4- or a 4-kv. line as on a high-tension line. The question is directly asked, "Why should not the low-voltage lines be grounded for the protection of men working on them when de-energized?"

Rubber Stamp Saves Time for Construction Crew

To assist construction and maintenance crews to locate jobs covered by various work orders, a rubber stamp, the impression of which is reproduced herewith, has proved itself worthwhile. This idea was developed some time ago by H. W. Cooper of the Pacific Power & Light Company.



By making an imprint of this stamp on the back of all work orders before they are issued to the crews, filling in the names of the streets involved in each particular case and placing an "X" at the approximate location of the job, an appreciable amount of time is saved by the crews in locating the various jobs.

NEW BOOKS for the Engineer

THE ART OF RAPID READING, by Walter D. Pitkin, professor of journalism, Columbia University. First edition; cloth bound; 6 x 8¼ in.; 233 pages. Published 1929 by the McGraw-Hill Book Company, Inc., New York. For sale by Book Department, McGraw-Hill Company of California, 883 Mission St., San Francisco. Price $2.50.—This book is published primarily for people who want to read faster and more accurately. Its six parts cover the causes of poor reading, how to improve word habits, how to improve eye grasp, how to skim, and gives exercises for practice and a progress chart for reading. Contending that the principal source of current information for the business or professional man is through reading, the author presents suggestions and rules designed to improve reading habits, and at the same time increase the vocabulary and improve expression. Particularly valuable are the author's suggestions for summarizing material read and filing these summaries. The book should prove both interesting and valuable to any man who reads, whether for pleasure or for information.

MECHANICAL CHARACTERISTICS OF TRANSMISSION LINES, by L. E. Imlay, consulting engineer, The Niagara Falls Power Company. Cloth bound; 9 x 12 in.; 74 pages; 74 illustrations. Published 1928 by Westinghouse Technical Night School Press, East Pittsburgh, Pa.—This book is a companion volume to "Electrical Characteristics of Transmission Lines" published in 1926. As its title indicates, this text deals with the mechanical problems incident to design and construction of power lines as they are met with by those who have to do with this class of work. The volume is intended especially for the man who finds himself confronted with a line design or construction job and would like to benefit from the experience of others.

ADVANCED LABORATORY PRACTICE IN ELECTRICITY AND MAGNETISM, by Earle Melvin Terry, Ph.D., professor of physics, University of Wisconsin. Cloth bound; 6 x 9 in.; 318 pages; 174 illustrations; second edition. Published 1929 by McGraw-Hill Book Company, Inc., New York. For sale by Book Department, McGraw-Hill Company of California, 883 Mission St., San Francisco. Price $3.—It is the author's stated aim in producing this book to provide a text suitable to the needs of the student who can devote only one year to a study of electricity and magnetism in addition to the work covered in a standard elementary course in general physics. Particular attention is given to experiments involving vacuum tubes. The text is not devoted exclusively to the experiments it outlines, but also gives the fundamental information involved in the experiments. In all, 52 actual experiments are given, ranging from the determination of the specific resistance of materials to the calibration of a vacuum-tube voltmeter.

ELEMENTS OF RADIO COMMUNICATION, by John H. Morecroft, professor of electrical engineering, Columbia University, and past president, I.R.E. Cloth bound; 6 x 9in.; 269 pages; 170 illustrations. Published 1929 by John Wiley & Sons, Inc., 440 Fouth Ave., New York. Price $3.—This text is designed as an introductory volume to the author's more technical and comprehensive volume, "Principles of Radio Communication." To meet the demand of those wishing something more sound than the so-called "popular" texts on radio subjects, but having neither the time nor the preparation for the "heavier" text of the "Principals," this new volume has been prepared. The plan of presentation of subject matter is much the same as that followed in the larger volume, but no mathematical preparation more advanced than algebra is required for complete understanding of this elementary text. Fundamentals are treated, broadcasting is emphasized, and different receiving sets and circuits are discussed.

DIRECT CURRENTS, by Carl Edward Magnusson, professor of electrical engineering and director of engineering experiment station, University of Washington, Seattle. Cloth bound; 6 x 9 in.; 495 pages; profusely illustrated. First edition. Published 1929 by McGraw-Hill Book Company, Inc., New York. Price $4.50. For sale by Book Department, McGraw-Hill Company of California, 883 Mission St., San Francisco.—This book is designed as a companion volume of the author's "Alternating Currents" and "Electric Transients," with which it forms a set of electrical engineering texts covering the fundamental laws of electric phenomena as applied to practical electrical engineering problems. The field of this text, of course, is well established and the author apparently has attempted to do nothing further than gather together what he considers to be the basic principles of d.c. circuits and equipment and present these data in a logical and orderly progression. Practical problems are given in connection with almost every chapter.

IRRIGATION DISTRICTS IN CALIFORNIA, by Frank Adams, irrigation economist, University of California Agricultural Experiment Station, and irrigation manager, Division of Agricultural Engineering, U. S. Department of Agriculture. Paper bound; 6 x 9 in.; 421 pages; 41 illustrations; 5 tables. Published by the State of California, Department of Public Works, as Bulletin No. 21 of the Division of Engineering and Irrigation.—For those interested in California irrigation history and development this book certainly should be a valuable reference work. It treats each separate development independently and gives rather detailed information under the following headings: history, soils and topography, water supply, adjustment of water-right contracts, use and delivery of water, bonds, and assessments and water tolls.

FORTY YEARS WITH GENERAL ELECTRIC, by John T. Broderick. Cloth bound; 5 x 8 in.; 218 pages; illustrated. Published 1929 by Fort Orange Press, Fort Orange, N. Y. Price $2.50.—This is an historical work describing in an interesting fashion one of the electrical industry's largest organizations and presenting illuminating highlights concerning many important personages whose names are associated with the upbuilding of the industry. It is the story of business achievement with a biographical setting and atmosphere. It covers incidentally much of the story of applied electricity since 1880.

Ideas for the Contractor

FAMOUS TOWER A GUIDING STAR

Accomplished by a Combination of Neon, Mercury Vapor and White Lighting

SAN FRANCISCO'S famous Ferry Building, through which it is estimated 51,000,000 people pass during a year, has donned new and sparkling habiliment appropriate to the modern age in which it, although a pioneer, finds itself. Dedicated during the week of Light's Golden Jubilee and now regularly illuminated on Saturdays and Sundays and other festive occasions, this brightly bedecked gateway tower welcomes those who pass through the portals beneath it.

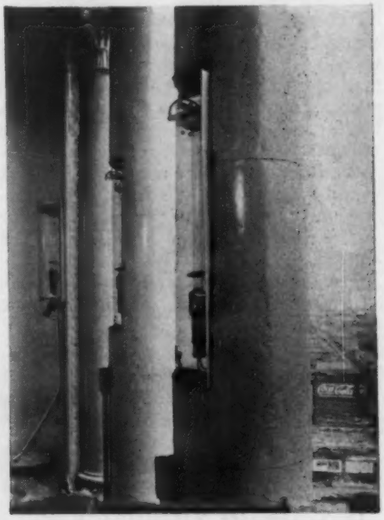
The former lighting on the Ferry Tower consisted of the customary outline lighting of earlier days. Not long ago it was decided to modernize this lighting. Consultations were held and plans made under the direction of Frank G. White, chief engineer, and C. P. Stanton, chief electrician. Mr. Stanton worked out the difficult problems of the installation. His familiarity with the construction of the building and with every circuit in it helped materially to keep the cost of the installation at a minimum.

The Ferry Building is 661 ft. long, 150 ft. wide, and is surmounted by a tower 235 ft. high. The tower has been repainted a light grey color better to reflect the light and harmonize with the remainder of the building. The reflection factor is fairly good.

The lower part of the tower extending to just above the clock, rising to an elevation of 143 ft., is floodlighted on all four sides by 24-in., 1,500-watt cast aluminum weatherproof floodlights. Twenty of these in all are used. On the bay side and the two ends of the tower the floodlights are mounted on the roof of the main building. To light the front of the tower three floodlights are mounted on a 30-ft. steel pole erected in the parking directly in front of the building. The pole is about 150 ft. in front of the building. Two other floodlights are mounted on the roof directly behind the front facade. The average intensity delivered is 15 foot-candles at the foot of the tower, increasing to 25 foot-candles at the top of the floodlighted portion, which stops at the base of the first set of pilasters.

But for its brilliant color—red cap and red walls behind the pilasters, green clock faces and white over all—this is how the tower appears on Saturdays, Sundays and festive occasions

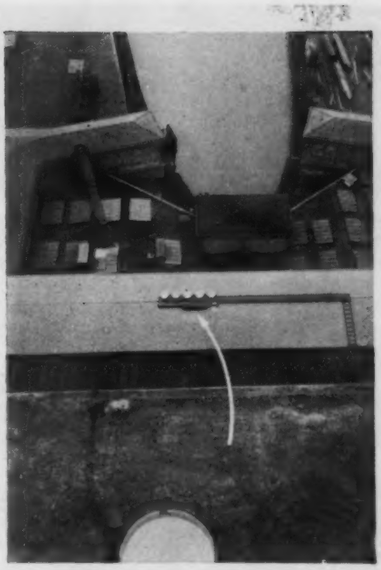
Auxiliary control equipment for the neon lights in the pilasters outside is mounted in the tower on asbestos covered tables



Hot cathode neon tubes and reflectors were mounted in spaces cut into the pilasters at the top of the tower to floodlight the wall behind them in red

At the base of these pilasters is an offset in the roof construction which permits the recessing of 48 200-watt, concentrating beam, mirrored glass reflectors to project the light directly upward. This floods the projecting offset at the top of the pilasters. At each of the four corners are recessed 16 500-watt concentrating beam units to illuminate the wide corners with a very high intensity of silvery white light. All of these units are recessed flush with the roof and protected with cover glass plates. This method of mounting permits maintenance to be carried on from the inside of the tower.

Recessed in the rear of each pilaster is a hot cathode, low-voltage neon tube mounted in a porcelain trough reflector. This produces a brilliant red light. This type of tube is rated to deliver approximately 5,500 lumens, which is consid-



Looking down on the ledge in the foreground is seen one of the glass covers over a porcelain unit to light the tower tier above. The arrow points to a bank of floodlights which light the main shaft of the tower

erably in excess of the light output of the cold neon tubing. The effect of this lighting is to silhouette the pilasters in white against the brilliant red background.

In the second offset of the roof are recessed 52 100-watt porcelain enameled angle reflectors. The third offset is illuminated by 44 200-watt porcelain enameled angle reflectors recessed in the roof, while the fourth offset has recessed in it 48 100-watt porcelain enameled angle reflectors. Each of these reflectors is protected by a glass cover mounted flush in the roof.

On the fifth offset is a second set of pilasters. Behind each is mounted a hot cathode neon tube. To frame this offset and to light the pilasters 20 150-watt porcelain enameled angle reflectors and 16 500-watt mirrored glass units are recessed in the roof, each protected with cover glass.

On the sixth level are 28 200-watt mirrored glass units recessed in the roof. These illuminate the projected portion of the roof directly above without interfering with the silhouetted pilasters. At the base of each pilaster is mounted a hot cathode neon tube. This lighting is supplemented at this level with twelve 200-watt floodlight units with red color lenses.

On the top level six of the hot cathode neon tubes are placed at the base of the pilasters. Because of the small diameter of the roof at this point and the construction, the units could not be recessed. Therefore thirteen 200-watt floodlight units were mounted flat on the roof to illuminate the offset directly above with white light. The ornamental coping hides these units from view.

At the very top ledge of the base of the dome there are mounted flat on the roof eight of the neon tubes to throw red light on the curved dome. To harmonize the extreme top with the rest of the tower an especially designed lantern was made of amber glass. In this are mounted four of the hot cathode neon tubes. This lantern is so constructed as to permit easy maintenance and is large enough to permit the flag pole to pass through its center. The red light shining through the amber glass produces a bright star effect which acts as a beacon alike for airplanes and shipping around San Francisco Bay.

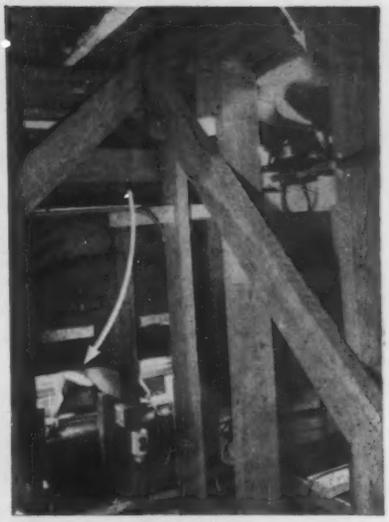
It was found after the floodlights had been trained on the lower part of the tower that the clock face previously illuminated from within by means of white light was being washed out. To provide contrast for the clock face there was mounted behind each of the four faces one of the ordinary mercury vapor tubes with the reflector removed.

Looking down on one of the upper ledges. This shows both the mirrored glass reflectors at the corner and the porcelain reflector which lights the pilaster

These tubes emit a greenish-blue light which sets off the dial face of the clock in contrast to the white light of the floodlighted tower.

The total connected load in the lighting of the tower is 124.40 kw. The wiring was done by the Harbor Commission's electrical force under the direction of Mr. Stanton.

Looking down on the Market St. side to the pole in the parking on which are mounted units to light the front of the Ferry Building tower



Arrows point to the lighting units, mounted on swivel hangers so that they may be swung inside for relamping. A glass cover protects them from the weather. Note the plug connections adjacent to each reflector, for easy disconnecting

Architect Writes Red Seal in Plans

That the architects are beginning to appreciate the inspection service and the high-grade requirements of the Red Seal Plan is given fresh evidence every day. One of the most definite statements relative to the Red Seal requirements yet made was that contained in a set of plans and specifications issued recently by Brainerd Jones, architect at Petaluma, Calif. It is a statement from which all contractors would benefit if incorporated in all specifications.

The statement follows:

All electrical work is to be performed in the best and most workmanlike manner, in full accordance with the latest edition of the National Electrical Code, all local ordinances and all California state laws which are each and all made a part of these specifications; and all work installed and materials used must comply with these rules, notwithstanding anything in these specifications or the accompanying drawings which might be construed to the contrary.

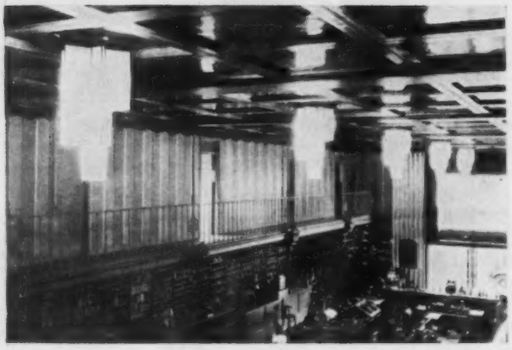
All electrical work shall also conform with all requirements of the "Red Seal Plan" of the California Electrical Bureau, 447 Sutter St., San Francisco, Calif.

The electrical contractor shall immediately upon being awarded the contract for wiring this building, fill in a proper application blank and shall return same to the chairman of this district, who will arrange for the necessary service and will provide him with a Red Seal job card.

The electrical contractor shall further see that all necessary and usual inspections of the electrical wiring and work are made at the proper time; at completion of the work he shall tender to the owner, a Red Seal Certificate for the electrical work at this building, showing that all requirements of the California Electrical Bureau's Red Seal Plan have been complied with.

MODERN

A San Diego de luxe grocery recently moved into an ultra modern store. Its fixtures and lighting arrangements are unique



The exterior, shown at the top of the page, has ornamental urns and coves to light it. The interiors, shown above and at left, make use of glass plates in box and geometrical designs. Wiring was done by A. R. Damarus of San Diego

Complete Electric High School at Pioneer City of Auburn

GOLD RUSH days of '49 found Auburn (Calif.) a bustling community. Progress was its watchword and still is. The Placer Union High School, a half dozen large buildings in all, is completely electrically heated. It has 326 kw. in air heat, 124 kw. in cooking and water heating in its cafeteria and building use, 100 kw. in lighting and 44 hp. in motor load. Its maximum demand averages 288 kw. In 1928 its complete electric cost was $2,364.50, or an average of less than $6.50 a day. Installation was made by Newbery-Pearce Company, of San Francisco.

Mobile Color Lighting Floods Bank Tower

BY PROVIDING the means whereby a constant variation of color effect may be produced in the floodlighting of the tower of the Bank of Italy, San Jose, Calif., a distinct advertising value is given to this installation. For the tower of the building designed by Henry A. Minton, architect, Charles T. Phillips, consulting electrical engineer of San Francisco, laid out the floodlighting installation utilizing Wuelker's especially designed lighting equipment.

By this means a flexible medium for laying on of any desired color, as one would paint color on with a brush, is provided. The tower is lighted first from the main roof by a bank of 50 1,000-watt floodlighting projectors equipped with a special tempered bowed glass. This provides a white light diffusion over the entire structure.

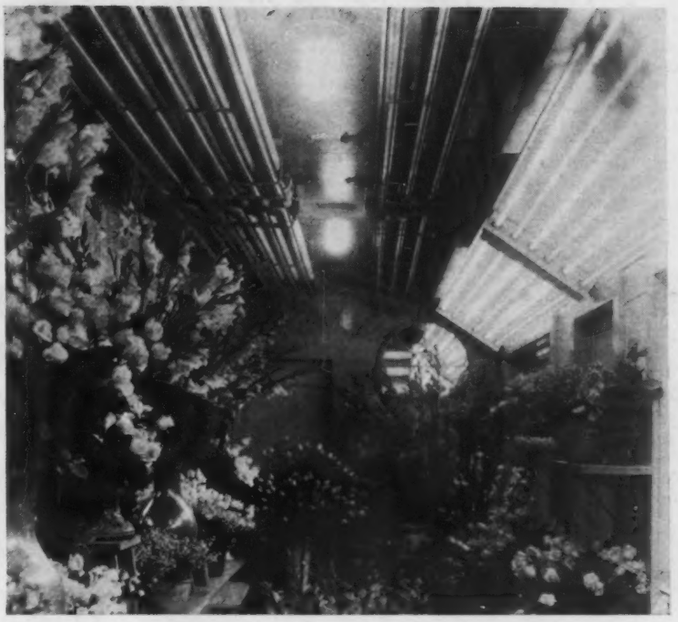
On the second tier are placed twelve 200-watt reflectors to illuminate the face of the main tower. Inside the tower are still another set of reflectors to coat the interior of the tower with its own particular color of light.

A focusing spot light, located on the roof, is trained on the flag in such a way as to keep it illuminated no matter in what direction it may be flying. The installation was made by H. F. Haverkam, of San Francisco.

To illustrate the method of combining colors—at one time the interior around

San Jose Bank of Italy tower as it appears at night

the dome of the tower appeared a bright red. The outside was toned in a deep blue providing a rich contrast. Another combination floods the exterior with gold and amber and the interior of the dome with blue.



Neon Window Lighting in Florist Shop

AN INTERESTING new application of Neon tube lighting has been developed by the Electrical Products Corporation, Seattle, in replacing incandescent lighting in the refrigerated show windows of Rosaia Bros., florists of that city, with Neon red and blue tubes. The heat radiated by the high intensity of incandescent lamps originally installed made refrigeration of the room difficult. It had been decided that it would be necessary either to increase the refrigeration capacity materially or decrease the intensity of light, when a suggested solution was offered by the Electrical Products Corporation through the use of the comparatively cool Neon lighting.

A bank of three red and three blue tubes was installed the length of the room near the refrigeration pipes hung from the ceiling. This installation gave a good intensity, was sufficiently cool so that it did not affect the installed refrigeration capacity, and had a markedly favorable effect on the flowers displayed.

Because of the fact that all colors are present in the blue and red glow of the tubes, the many color shadings of the widely different varieties of flowers displayed were brought out and intensified. Principally because of the color effect produced, the customer has taken steps to install Neon tube lighting in his other show windows which are not refrigerated.

Because of the relatively low current consumption, and because the lighting is equally effective by day and by night, the installation is allowed to burn continuously.

Let Street Lights Burn At Less Cost

For some reason or other cities have continued to install street-lighting systems so arranged that one or more of the lighting units could be switched off at midnight, the remainder to stay on. Obviously this was done in the interest of economy. However, a recent analysis of the subject made by William T. Bear, street-lighting engineer for the Pacific Gas and Electric Company, reveals this to be false economy.

When the switching off of one light of the two-light standard is to be accomplished, it requires the installation of a separate series transformer in the base of the posts. It requires also an extra wire in the circuit for which a conduit of larger diameter must be installed.

Assuming the average distance between electroliers to be 125 ft. and the lamps of approximately 600 c.p., the transformer to be type I.L. or equal, with terminals for sweating, the installation cost per electrolier on this basis will be about as follows:

Transformer plus installation	$21.25
Extra wire, extra size conduit and extra labor	22.75
Total extra cost per electrolier	$44.00

Interest and depreciation on this $44 amounts to $7.33 per year or 61 cents per month. This is at a saving of only 44 per cent per month in the rate where the lighting is costing ¾ cent per kw.-hr. after 12 o'clock midnight. In addition to this, some one must maintain the additional equipment.

Control "Special Conditions" Classed

IN CONNECTION with the table of definitions of control equipment approved by the American Standards Committee, published in this department last month, a table of so-called "special conditions" is presented below. The definitions given in the previous list were for standard conditions. In the following will be found the conditions recognized as "special" properly classified in order. As in the previous instance this arrangement is republished from a form prepared by the General Electric Company but may be considered standard for all makes of equipment.

Classification of Special Conditions

Unusual conditions to which control apparatus may be subjected have been classified in a general way and given reference numbers as follows:

No. 1—Ordinary amounts of moisture, without any acid, or conducting or abrasive dust.

No. 2—Excessive moisture, steam or salt air with or without weak acid or alkali fumes.

No. 3—Strong acid or alkali fumes.

No. 4—Excessive amounts of conducting or abrasive dust, such as carbon, coke, graphite, iron, cement, etc.

No. 5—Explosive or inflammable gases, dusts or fumes.

No. 6—Excessive vibration.

No. 7—Occasional or repeated submergence, as on the deck of a ship.

No. 8—Ambient temperatures in excess of 40 deg. C., but not exceeding 80 deg. C.

It is usually not sufficient to give merely the condition number. Full particulars of the condition to be met must be given in each case.

The following recommendations would ordinarily be used for the conditions outlined:

No. 1—Standard device.

No. 2—All small steel parts of devices cadmium plated; large steel parts and castings red leaded before painting; bearings of bronze or brass; enclosing cases with one coat of red lead and one coat of acid-resisting varnish. (For extreme conditions, enclosing cases may be of brass.)

No. 3—(a) All steel parts of devices cadmium plated; bearings of bronze or brass; cast-iron or welded-steel cases with red lead and acid-resisting varnish and provided with gasketed joints.
(b) Control apparatus oil-immersed, standard oil-tank construction.

No. 4—Standard devices mounted in cast-iron or welded-steel cases with dust-tight joints.

No. 5—Special enclosing cases, or equipment immersed in oil. (No exposed contacts.)

No. 6—Special equipment.

No. 7—All small steel parts of devices cadmium plated; large steel parts and castings red leaded before painting; bearings of bronze or brass; cast-iron or welded-steel cases red leaded before painting and provided with rubber or greased hemp gaskets.

No. 8—Resistance in series with coils and current-carrying parts derated; otherwise standard.

Special devices should not be specified unless there is a certainty that standard devices are insufficient. It should never be overlooked that special features add considerably to the price and time of delivery of the apparatus.

The special features increase the life of the device over that of a standard device subjected to the same condition. However, no device can be considered proof against ultimate deterioration.

Jump the Grounded Bar

MAKING repairs that are in the interests of economy and time to the customer is an important phase of motor shop service. A recent repair job done by the California Electric Works at San Diego illustrates this point.

A ground was located in a coil or strap at the bottom of the slot of a 200-hp. 1,200-r.p.m. Fairbanks-Morse wound rotor. It was discovered after several of the end clips had been removed. This ground had appeared after new bands had been installed on the old winding and it was feared that the removal of the bands and pulling out of the bars would probably cause more grounds in the old insulation after rebanding.

The customer would not have it rewound, so after testing the complete winding with 1,100 volts to ground it was decided to cut out the grounded strap shown by the dotted lines. The shop had never before heard of any such method but decided to try it. The end of the grounded strap was cut off as close as possible and a jumper of sufficient size was run from one end down through the spider and up to the bar on the other end.

Since this repair job the motor has pulled 225 hp. continuously. Any other method of repair would have been extremely difficult as it was a bottom bar which was grounded.

MOTOR

A Department for and by Motor Specialists

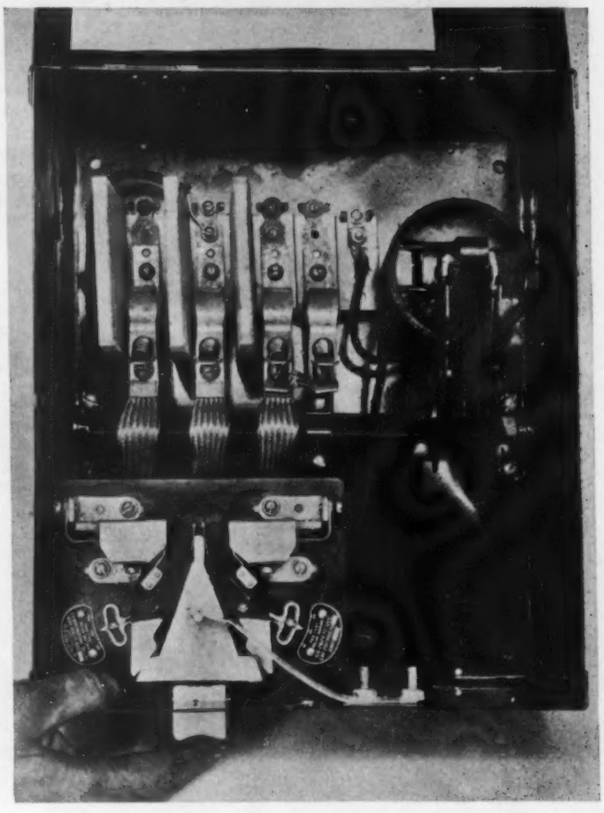
TAMPER-PROOF LIMIT SWITCH

Motor Shop Develops Resetting Device Which Prevents "Sitting on the Safety Valve" and Makes Maximum Demand Meter Unnecessary

WHEREVER the load maximum demand of an industrial or other plant determines the rate earned there has been need for some sort of load limiting switch device that would cut off the power and that could not be tied down or tampered with. In practically every type of load-limiting switch made it has been possible to prop up, tie in or otherwise make inoperative the load-limiting feature of the device even when the can has been sealed by the power company. For this reason loads of a type which could be put on a limited demand basis have had to be wired through a maximum demand meter.

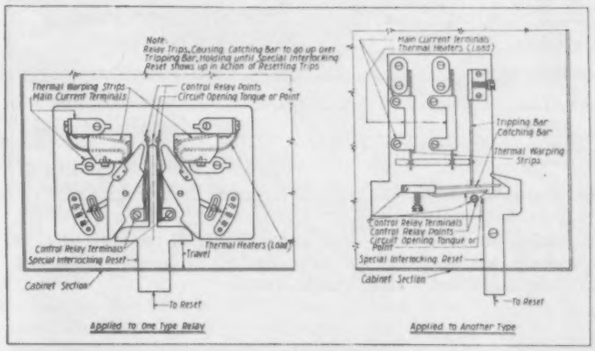
The latter penalizes the user for several months if for a few minutes he uses over his ordinary requirements. Neither does the meter throw the load off the line or offer any protection to power company transformers or equipment.

To meet the need for a limit switch device which could



FORUM

in the Interest of a Better Motor Trade



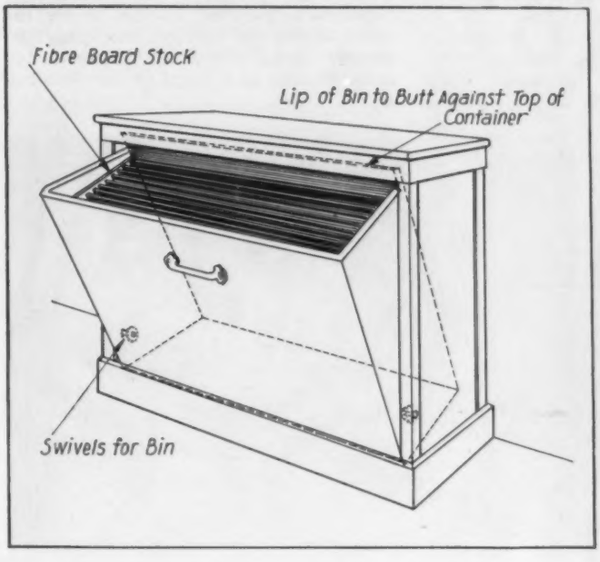
not be held in and thus provide its customers with a rate based on lower demands, the California Electric Works of San Diego devised the resetting device pictured here. The diagram shows its operation. When held in, the circuit remains open. It is only closed after the button has been pushed in and released again. Frank W. Sloan designed and patented the device.

This interlocking reset in no way alters the standard thermal relay. It acts as a stop button also. Its application is desirable on all overload relays and circuit breakers, either for motor, industrial or even heating loads, both commercial and residential. The user as a rule leaves any switch alone until some trouble develops. Then when it does its intended work he is prone to tie it or prop it shut instead of eliminating the overloaded or hazardous condition.

The power company has tested and approved this device on several San Diego installations, allowing its use in place of a maximum demand meter. Tests show its operating conditions superior to the oil dashpot type, it is maintained.

Flour Bin Idea In Fiber Storage

ONE OF the problems of a motor shop, namely that of storage of fiber board in such a way as to take little space, has been solved by Tinling & Powell, Spokane motor specialists, by the construction of a bin as shown in the accompanying diagram and located at the base of shallow shelving in the shop. The principle employed is that of the ordinary domestic flour bin extended in size to accommodate the largest sheets of fiber.



This method of handling has the advantage of taking little horizontal floor space and utilizing vertical space instead which is practically wasted anyway. The vertical storage of the sheets makes it easier also to remove the particular sheet wanted from the stock without the pressure of the entire stock weight upon it. When closed there is the further advantage of its being dust free.

Bouncing Balls Attract Crowds

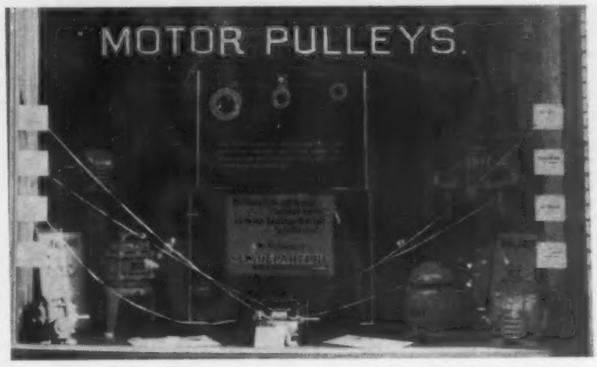
IT IS not often that a window display in a motor shop stops a crowd, but when the Farnsworth Electric Company, of San Francisco, put on demonstration in its window the spectacular ball bearing test display of the New Departure Company there were crowds around the window all day long.

The ball bearing display consists of a large box delicately adjusted on screw jack supports. On the upper part is

mounted at the right a small ball bearing unit through which balls are dropped to a plate anvil adjusted to the correct phase angle to bounce the ball up and across the face of the display just in time to jump through another ball race and frame which is rotating in a vertical plane on a horizontal axis. Completing its arc, the ball drops toward the left of the display to a second anvil likewise adjusted to bounce the ball back toward the back of the display and through a large ball bearing unit. At the rear of the display is a simple mechanism to return the balls to the point of starting.

So delicately adjusted must the display be kept that a heavy truck passing and shaking the building causes balls to deflect and fall to the floor. Naturally so seemingly "magic" a stunt as that of balls jumping through a hoop stops crowds of passersby.

Horace Adams, proprietor of the Farnsworth Electric Company, took occasion to combine with this display one of motors equipped with these ball bearings.



Credit Information Card Kept in Portland

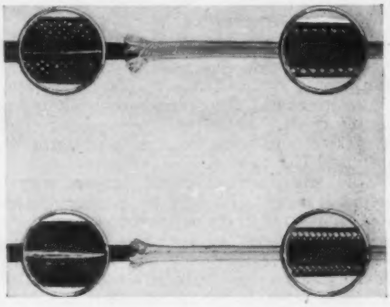
CREDIT INFORMATION BLANK		REFERENCE FROM:	MANNER OF PAYMENT
NAME OF FIRM		SOLD SINCE	DISCOUNTS
ADDRESS DATE		TERMS	PROMPT AND SATISFACTORY
ENGAGED IN		HIGHEST RECENT CREDIT $	SLOW BUT CONSIDERED GOOD
DUNS BRADSTREETS		OWING NOW ON OPEN ACCOUNT $	SLOW AND UNSATISFACTORY
SPECIAL INFORMATION	ACCT. O K.-d BY	ON NOTES $	PAYS C. O. D.
		PAST DUE ON OPEN ACCOUNT $	SELL FOR CASH ONLY
	DATE	ON NOTES $	ACCOUNT SECURED
	CREDIT LIMIT	FIRST ORDER	NOTES SECURED
	TERMS:	OTHER INFORMATION	ACCOUNT CLOSED FOR CAUSE
			MAKES UNJUST CLAIMS
			COLLECTED BY ATTORNEY

FOR the protection of electrical contractors from unscrupulous building contractors a credit information card has been worked out by the electrical contractors of Portland, Ore. Every contractor who desires may participate in this exchange of information regarding the credit habits and standing of general contractors, or for that matter purchasers of electrical supplies. The items noted on the card are shown plainly in the above illustration. The last column on the back of the card is considered the most important. It is labeled "Manner of Payment" and gives an idea of the paying habits of the customer.

No action is recommended nor does any group agreement exist on the matter. The card is merely for the individual information of the members.

New Code Cord Standard

A new standard has been established by the Underwriters' Laboratories for flexible cords. Beginning Jan. 1, 1930, all code cords are to be manufactured to comply with the new standard. The characteristics of the new standard are best illustrated in the photograph, right, with the enlarged sections showing the difference in the weave of the old and the new cords. It will be noticed that in the new cord all adjacent threads of all braids touch.

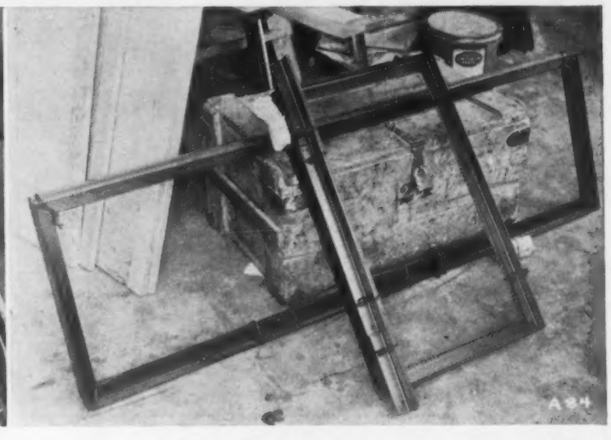


Traveling Stockroom for Talkie Installations

SPECIALIZING in the installation of talking moving picture equipment, Edward Martin, of the Sterling Electric Company, San Francisco, has reduced the problem of supplies on the remote job to a very simple matter. Talkie equipment on order usually is scheduled for delivery on a certain date. Thus Mr. Martin stocks up the heavy stock box shown above with sufficient extra pipe fittings, connectors, lock nuts and other miscellaneous materials to carry the journeyman sent out on the job through two installations. This removes the need for hurry calls for extra fittings and delays on the job.

The box is provided with removable trays cut up into compartments. Small fittings are placed in these. The heavier material, such as pull boxes, portable tools, testing batteries and the like, are placed in the bottom. A heavy lock protects the material from theft.

Battery racks likewise are built in sections and sent in a knocked-down condition to the job. The picture on the right shows the storage box and the battery racks ready for shipment to some theater in a town either near by or far away.



The *Lighting Layout* for an Industrial

Further Consideration of the Planning and Selling of Industrial Illumination by the Electrical Contractor

By J. R. WILSON, Quality Electric Works, Los Angeles

STRUCTURAL design of the building usually will determine just how symmetrical a lighting layout can be made. A layout which would be ideal in a building built entirely of steel columns and light angle or tee iron members might be entirely unsuited (from the viewpoint of symmetry) to a concrete building having a great number of large re-inforced beams supported on square, round, or "mushroom" columns. For the purpose of making this point clear, the layouts given herein will prove of interest.

Layout A—Four units per bay: The most common system where bays are square and of the usual dimensions.

Layout B—Four-two system: Where permissible spacing allows, this system is equivalent to three units per bay, and is a good alternative of the four-per-bay system.

Layout C—Two units per bay: Where the bays are narrow, for instance where the width is less than two-thirds the length, this system usually will give very good results if the units are of proper size.

Layout D—One unit per bay. While this is a very common practice it is satisfactory only where the bay size is no greater than the maximum permissible spacing. This ideal condition is very seldom met with in the usual types of industrial building.

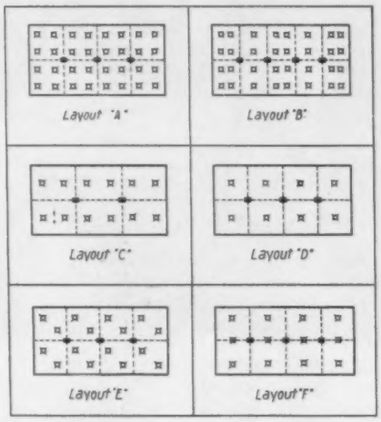
Layout E—Staggered system: In some cases one unit per bay does not provide satisfactory illumination and four units per bay are not necessary. In these cases the staggered system usually offers a satisfactory solution. However, this system has the disadvantage of a rather unsightly appearance and may often entail a rather expensive wiring job.

Layout F—Interspaced system: Where the bays are rectangular in shape, and where one per bay would exceed the permissible spacing in the long dimension, this system offers a possible solution. However, care should be taken to ascertain that the center row will not interfere with future partitions, shelving, etc.

Special Application Layouts

Group lighting: The units must be arranged in the best relation to the surfaces or parts they are intended to illuminate. This sometimes entails the sacrifice of symmetrical appearance in order that maximum efficiency may be attained. To serve the purposes of maximum production best, many different sizes and heights of machines may be included in a group. Great care is necessary in unit placement to see that the high machines do not cut off the light from points at which it is needed.

Craneways: The units should be mounted on the truss chords, or hung from a messenger cable. To avoid the possibility of the crane blocking off all



of the light while traveling along the runway, the units should be staggered. In many cases it is an excellent idea to install additional units on the bottom of the crane itself. This scheme provides light directly under the crane at any point at which the crane may be. These outlets should be suspended from flexible metallic tubing, to withstand the shock of the sudden starting and stopping of the crane. They should also be provided with metal reflectors to keep the glare of the lamps out of the eyes of the crane operator, and to send all of the light downward. These crane-bottom lamps can be supplied with current through a small transformer of the dry type—the primary being fed from the crane trolleys.

Angle units: In erecting shops where high bays prevail excellent illumination at the working floor level can be attained by use of angle reflectors placed on the columns at a height of approximately 20 ft. This scheme is excellent also for lighting the working parts of high machines, such as large boring mills, etc.

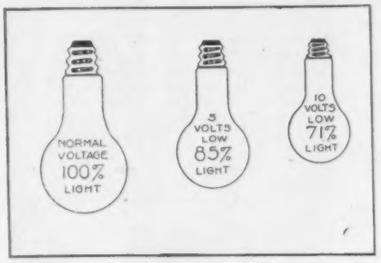


Chart showing effect of low voltage on light

Bench lighting: In many cases a well planned general lighting system will make the use of additional local bench lights unnecessary. However, where fine work is to be performed, bench lights may have to be installed. Bench vises, bench lathes, bench drills, bench grinders—all of these types of machines many times require individual light. Where used, these lights should be provided with frosted lamps and metal shades of cone shape, to eliminate all possibility of glare.

Special units: The use of light in industry is so great and so varied that many special application problems are bound to arise. Usually a little study of each case will always present a possible solution of the problem. If an estimator feels that he has not the necessary knowledge or experience to make recommendations in these special cases, he will always find the utilities or the reflector manufacturers able and willing to assist him.

Much of the data contained in this series of articles was prepared by the Benjamin Electric Manufacturing Company and the Edison Lamp Works of the General Electric Company. The author gratefully acknowledges the obligation for their use.

The next article will cover the uses of Cooper-Hewitt lamps in industrial lighting.

Mercury vapor lamps will have a different status in the 1929 National Electrical Code due to revision of Art. 15, Sec. 1503. The changes allow branch circuits supplying only mercury vapor lamps to be protected by fuses or overload protective devices of a rated capacity not greater than 40 amp. at 125 volts or less and 20 amp. for higher voltages. Where a group of mercury vapor lamps is wired in parallel and mounted on a single frame, the total capacity of which does not exceed 4,000 watts, it is provided that a separate branch circuit having a suitable automatic overload protective device on each ungrounded conductor may be used. This new rule permits higher fuse rating on currents supplying only lamps of this sort than was permitted in the previous code.

Better Merchandising

Christmas parties for employees are made gay when an attractive stage setting, such as that at the right, is made the central feature. This display was made by J. U. Berry, advertising manager, Valley Electrical Supply Company, for the San Joaquin Power Club party last Christmas

A seasonal greeting advertisement such as that of the Southern California Edison Company, shown at the bottom of the page, is always an appropriate gesture. The ingenious use of type and "Busy Buttons" figure to form a tree gave it all the decoration required

Last Minute CHRISTMAS *Plans and Ideas*

Cash the Checks

BANKS throughout the land have very helpfully aided folks to save up various sums to be spent at Christmas time. All lines of merchandising recognize this as a golden opportunity for their own gifts. Electrical merchandisers will do well to advertise that they will cash these gift savings checks. A letter to each name on the best mailing list will offer this service. It should help place electrical gifts before those who have saved to buy.

Outdoor Decorating

EVERYWHERE in the West homes, streets, gardens and buildings will be decorated with colored streamers of lights during the holiday season. In Denver and Salt Lake City, where the idea was first developed to a city-wide movement, bigger and better programs are in process today. In many other communities, from Spokane and Seattle to San Diego and Yuma, organized local contests and civic movements to decorate with lighted trees and street decorations are well along.

San Francisco's downtown merchants, catching the spirit from last year's efforts in Hollywood, Watsonville and perhaps other business districts, have set aside funds for a major program of downtown Yuletide lighting.

The Christmas out-of-doors program for southern California is well under way. Programs for the various service clubs have been arranged and it is anticipated that this year's accomplishments will far outdo anything which has even been done before.

Last year approximately 25,000 outdoor Christmas trees were lighted up. The present program calls for 50,000 outdoor trees to be decorated this coming season. At least 20,000 carol singers will be enlisted to cover the entire southern California territory on Christmas Eve, singing Christmas carols from house to house.

The various municipalities are planning to light up their business streets with suitable decorative effects. Hollywood led the way last year with its famous Santa Claus Lane. This idea has been picked up by a number of other cities and it is anticipated that every city of any size in southern California will bear its share of this carrying on of the Christmas spirit.

At the Los Angeles Electric Club luncheon meeting on Nov. 4 the entire

Season's Greetings
CHRISTMAS
1928
TO THE
118,000
EDISON
STOCKHOLDERS
At Christmas time, as the broad pathway of the New Year opens wide before us all, our thoughts go out to each of our friends to wish them well in all their endeavors
Among our assets we like to count the only one that money cannot buy—your good will.
And so, not in the sense of custom only, but with a genuine appreciation of our pleasant associations during the past year, we extend to you our best wishes for an old fashioned Merry Christmas and a New Year of health, happiness and prosperity.
Owned by
Edison
Serving 70
Counties in
Southern
California

Everywhere buildings and homes will be lighted by streamers of colored lights

program was given over to inspirational and fact talks on Christmas out-of-doors.

This is typical of all the West this year. It will be the greatest event of its kind in history, appropriately enough in the year of Light's Golden Jubilee.

Free Rides

WOMEN shoppers in Pueblo, Colo., have been offered free street car rides to the shopping district during the hours between 9 and 11 a.m. for several Mondays before Christmas by the merchants of that city for the past two or three years. A token good for a car ride is given with each purchase made during those hours. This encourages early shopping and lessens traffic congestion.

In another city free taxi rides are being furnished on much the same plan.

Coffee for the Weary

AFTER weary hours of Christmas shopping imagine the comfort and cheer of a good cup of percolated coffee. The Grays Harbor Railway & Light Company, of Aberdeen, Wash., served many such cheering cups last year to those who came to its offices. Naturally it earned much good will and not a few sales thereby. What better demonstration of electrical coffee could be given?

Daily Calendar

MARKING off the days until Christmas on a big calendar in his windows, H. L. Miller, Pasadena, reminded the crowds which passed his store every day that they must buy now. Each day a date sheet was torn off and the next marked with the number of days left for shopping. Advertising could be made to carry the same idea.

Alphabet Suggestions

TO MAKE gift-giving as simple as A-B-C is a keynote which strikes the public squarely between the eyes. This is because gift-giving is always a stupendous problem at Christmas time. The electrical retailer who is alive to studying this problem will find that by simplifying gift-giving he not only helps the shopper but also his store.

An alphabet of gift suggestions, therefore, thrown out in newspaper copy or direct-mail circulars, helps to concentrate the shopper's mind and to formulate plans at home.

One electrical retailer makes it a practice at Christmas time to send out a series of postcards, one a week, each postal properly and suitably festooned with the season's trimmings, offering "Gift Suggestions," running the alphabet at each mailing, thus:

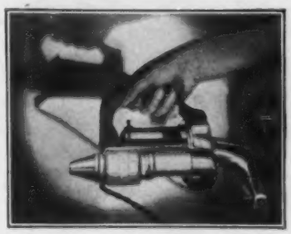
First Week—Electrical Household Appliances.
Second Week—Lamps.
Third Week—Electrical Merchandise.

And according to the theme, gifts were listed alphabetically, with a little illustration on each side of the card of those mentioned which were the most popular gifts.

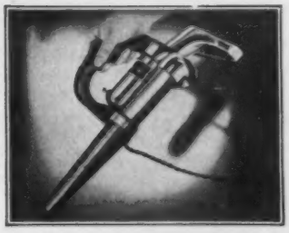
Another electrical dealer in his newspaper advertising used various letters of the alphabet running from A through to Z, and under each letter listed some item (not necessarily an alphabetical item), and then hooked this up with boxed illustrations on the side lines. In other words, his illustrations were run all around the advertisement in square box formation and simply keyed to the description on the inside of the picture frame effect or border thus formed.

New Christmas Features

Picked at Random From the Many Available



A deodorizer and a blower tool are attractive accessories of the Premier Spic-Span junior cleaner. Even a moth-killing deodorant is provided



Infra-red lamps, like those for ultra-violet, have home therapeutic uses. This is the new Burdick Zoalite using a silicon carbide unit

Sun lamps such as this of the Utah Radio Products are available in many styles and types

Many toasters now feature an automatic control. This from Westinghouse is of the turn-over variety

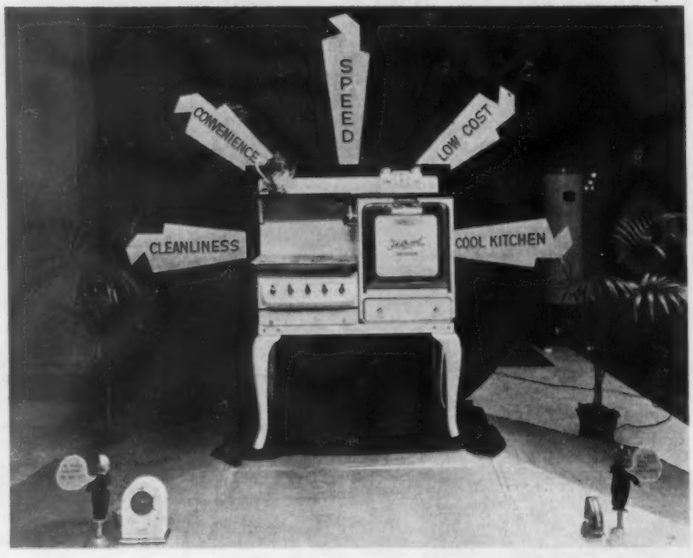
One of these husky Gem Kitchen Mechanics is indispensable to a modern kitchen. It does everything, almost, and does it better and faster

The window at the Cottage Grove (Ore.) office of the Mountain States Power Company, showing it as it appeared with the ordinary window lighting (*left*) and again with only the lighting inside the house (*right*)

Hotpoint Window Contest Winners Use New Methods

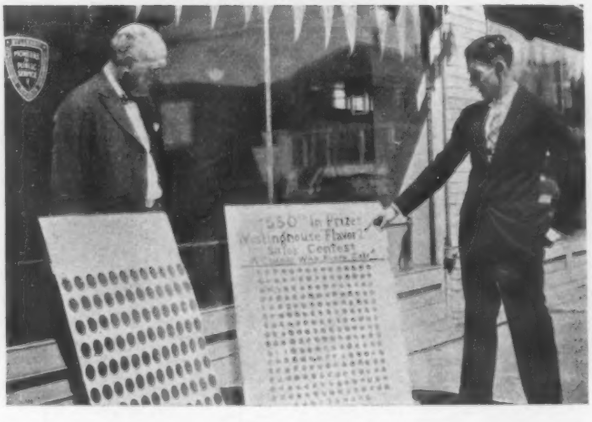
PRIZE winners in the recent Hotpoint window display contest, conducted over the entire West, demonstrated newer principles of merchandise display. The winning window was that of the Great Western Power Company, Sacramento. It was given first prize because of the simplicity and the directness of its sales message. The five salient features of electric cooking, each pointing toward a centrally placed range, focused attention upon it. At the front of the window were the clock and temperature control devices.

Another prize winner was that of the Mountain States Power Company at Cottage Grove, Ore. A small house occupied a large part of the window. At the side of it was a Santa Claus figure. A flasher alternately turned the lights outside the house off and those inside on, the interior when lighted revealing a range and refrigerator. The house itself had been fashioned of theatrical gauze on which the exterior of the house was painted.



Winning window of the Great Western Power Company at Sacramento

Boards Put *Punch* Into Salesmen



PUNCHBOARDS sometimes are taboo, but the merchandising departments of two Byllesby properties, the San Diego Consolidated Gas & Electric Company and the Mountain States Power Company, maintained employee interest and sold a record number of Westinghouse ranges by incorporating the element of chance in one "Flavor-Zone Range Campaign." C. M. Brewer, vice-president and general manager of the Mountain States Power Company is seen on the left inspecting the giant punchboards arranged by Glenn L. Jackson, sales manager (right), to stimulate interest of the sales department in the range campaign. More than 300 ranges were sold. Slips of paper entitling the holder to $300 in prize money were hidden in two punchboards. One board known as the "under quota board" had 100 punches ranging from $1 to $5. An "over quota board" also had 100 punches with cash prizes ranging from $2.50 to $15. There were absolutely no blanks. Every range sale entitled the salesman to a free punch at the weekly sales meetings.

Lighted "*Headpiece*" Makes Fixtures Sell

SALES of lamps and fixtures on the sales floor of the Public Service Company, Denver, materially increased when the lamp and fixture departments were given a more prominent position.

For a number of years the display of fixtures was presented to the public in a room on the second floor. Some fixtures were sold. Then the department was moved to the first floor and near the rear. Sales showed an increase because the merchandise was more readily seen by visitors who came into the building.

The floor and table lamps, too, had been on the first floor and near the rear of the building. Sales were good, but nothing extraordinary. A few months ago the department was moved to the front of the sales floor and put in a position where every person coming into the building could not escape noticing the lamps and fixtures displayed. Sales have shown a remarkable activity as a result.

One of the reasons, perhaps, that the sales have increased is the manner in which lamps and fixtures are displayed. There is the usual sales counter in front and a wall case at the rear where cartons of electric light globes are stocked. But across the top of the wall-case is a series of small alcoves, probably 3 ft. high, wide and deep. Each alcove contains a ceiling fixture and a couple of wall brackets. The designs in each alcove harmonize, but in each alcove a different kind and size of lamp is used. For example, in the ceiling fixture of one set, 50-watt lights may be burning while the wall brackets contain lights of lower wattage.

Above the counters where all can see.

In this manner customers may observe the intensities of the various sized fittings and also note the effect of the several types and colorings.

A third advantage in this arrangement is the advertising the department gets by having a well lighted "headpiece" which is the string of booths or alcoves across the top of the wall cases. So intense is the light pouring from the alcoves that it attracts the attention of all who come into the room.

In the "Gay 1908" Era of Electric Sales

SOMETIME prior to 1910 the Southern California Edison Company became conscious of the fact that it had been overlooking a splendid load-building opportunity in the small appliance field. It was decided that a "large force" of salesmen would be taken on to remedy this deficiency.

The picture shows the force that was recruited for this drive, all ready to step out and sell the electrical idea to the housewife.

Today the Southern California Edison Company has 65 sales specialists in the field, everyone of whom has been carefully trained to sell the larger items of electrical equipment, such as ranges, refrigerators, washing machines, etc. The smaller appliances, such as irons, percolators, toasters, and the like, are sold as staple merchandise over the counter in more than 70 offices of the company.

DEPICTING a cooking demonstration with an electrical background way back in the first decade of the twentieth century. At the time when this demonstration was held it was considered to be a decided forward step in the move to popularize the electric cooking idea. The cabinet with the row of switches was known as a "cooking outfit." It was designed for the express purpose of making it easy to use electric appliances. Needless to say this was all long before the days of the convenience outlet.

Twenty-five years from now our present electric cooking demonstrations may appear even more strange to us than this picture taken in 1908.

Contractor's Home Is His Best Salesman

FRED WEIDER, electrical contractor of Woodland, Calif., is another 100 per cent electric home owner. His recently built Red Seal home at 753 Third St., Woodland, is the best advertisement, he says, of the electric home idea that could possibly be built. His home is equipped with electric heaters, range, water heater—the latter two on a double-throw switch—refrigerator and appliances.

Special features of the wiring include a 16-circuit panel on the back porch. Eight of these circuits are heating circuits and eight circuits are for lighting and convenience outlets. There are 36 duplex convenience outlets in the house.

Underground service for both power and telephone comes to the switchboard at the rear of the house. From there it is distributed to the panelboard. The total connected load is 29 kw. Mr. Weider says his highest monthly bill has been $29, or $1 per kw.

The home is an actual example of what electrical convenience can mean, and Mr. Weider makes use of it in helping prospects plan their homes with adequate electrical conveniences. A number of old homes in the country about Woodland have recently been wired to Red Seal standards by Mr. Weider.

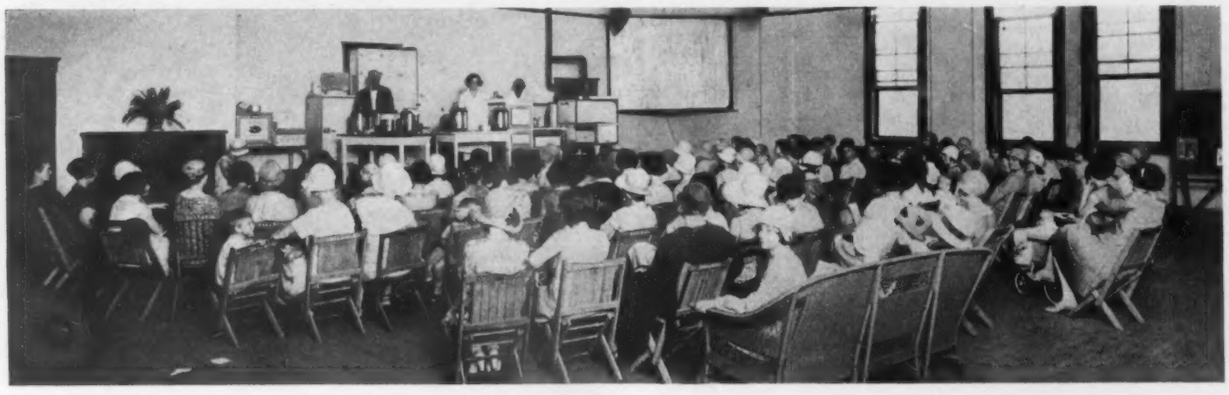
Not to Mention Ten Gallons of Frijoles

DURING the year that the home service department of the Tucson Gas, Electric Light & Power Company has been in existence, over 1,750 calls have been made to the homes of customers where new installations of ranges, refrigerators or electric water heaters had been installed or where the consumer had not thoroughly understood the using of gas and electricity and had complained of high bills. A cooking school has been conducted on one day each week, the attendance averaging from 87 to 150.

At this school attention is paid to other appliances besides the electric range. During the electric cooker campaign conducted by the company in May, for instance, the time of the class was devoted to the many uses of the cooker. Owing to the special advertising for this event an unusually large audience enjoyed this talk. Eight cookers were used in the demonstration, and meat, vegetables, cake, biscuits, pie, macaroni and apples were baked, meat was fried and sherbet was frozen, all in these appliances.

As a result of this demonstration, 65 cookers were sold. In addition to directing its attention to the public, the home service department of this company also undertakes to interest the employees of the company in electric appliances, occasional lectures and demonstrations being given for their benefit in connection with campaigns.

The cooker campaign was boosted, for instance, by means of the annual picnic at which 149 lb. of prime rib roasts and 10 gal. of frijoles were cooked in 22 cookers to feed 277 employees. All of the latter were allowed a part in the selling. Mrs. Jean D. Roberts is director of this work.



Floor Sales Back Up *Field Sales* in Cheyenne Set-up

The floor salesman knows just which one it is.

THREE of the salesmen employed by the Cheyenne Light, Fuel and Power Company, Cheyenne, Wyo., work exclusively on the sale of electrical appliances. Each has a territory of his own and in it he is master of all he surveys. It is his to have and to hold, providing he can hold it. As long as he is making a good job of it, the company is satisfied.

The salesman must consider his territory as his own business, look after the cutomers in it, adjust their complaints, service their equipment, in so far as he is able, and sell them more merchandise. He has about 1,200 meters on his territory which makes it possible to call upon each of his electricity users once in 90 days.

To get the best results from his territory and maintain his volume of sales, the salesman must not be sparing in giving personal service to his customers, because it is through giving personal service that he gains the confidence of his customers, augments his friendships and is able to bring to their attention the new developments and models of appliances which will lead to additional sales in the future. The plan works as follows:

Salesman Smith, in making his rounds, calls at the home of Mrs. Jones. In answer to his inquiry relative to the efficient functioning of electric appliances in her home, she may admit that there is something wrong with the toaster or the iron—or maybe it is one of the lamps. Smith offers to look at it and adjust it if it is something he can do himself. If it is beyond him, he steps to Mrs. Jones' Telephone and puts in an order for the service.

Seizing the Opportunity

If the appliance is a toaster, for example, of more or less ancient vintage, he has an excellent opportunity to create the sale of a new one. As he makes the adjustment he relates the excellent features of the newly designed toasters and recites the remarkable strides that the manufacturers have made in adding conveniences to their products. He must accomplish all of this in a most diplomatic manner lest Mrs. Jones suspect he is ridiculing her old toaster and is endeavoring to make a sale. If she suspects this, she probably will not only resent it but will close her ears to his remarks. He must not imply that she should trade the old toaster in on a new one.

Through the vivid and interesting pictures he paints with words, which conclude with the suggestion that the next time she is down town she drop into the sales room and look at the new toaster, he has created a bit of discontent with the old appliance. He may conclude his conversation with the statement, "You may not be interested in buying one, Mrs. Jones, but I believe you will be interested in seeing to what extent inventors and manufacturers have gone to make electrical appliances more convenient."

In nine cases out of ten the lady on her next visit to the store will see for herself the new appliance so well described by the salesman.

In the sales room she says, "I came in to look at one of those toasters Mr. Smith was telling me about." The floor salesman knows exactly what toaster it is, for it is one being featured at the time. She may buy immediately, or she may wait until Smith comes around again. Regardless of which way it happens, the floor salesman gets the visitor's name and notifies Smith, who, if the sale has not been made, calls back shortly afterwards.

Both Get Commission

The salesman gets his regular commission on all sales made to electricity users on his territory regardless of who makes them. If the floor salesman concludes the deal, he gets his regular commission, too, for the floor salesman gets a small commission on all appliances sold regardless of who sold them or where. This system makes for cooperation between outside and inside salesmen. Regardless of who makes the sale, there are no hard feelings.

So well has this system worked out that the volume of sales is made on the higher priced electrical merchandise. Almost 90 per cent of the toaster sales are of the automatic type costing around $12, says C. J. Hughes, new business manager. This is because the automatic type contains more talking points of interest to the average housewife.

Then, too, there is more money in the sale of higher priced merchandise—more commissions. There also is more customer satisfaction, for it is quite evident that the higher the price asked for an article, the more perfection has been constructed in it. There is a quicker turn-over, too, in the higher priced merchandise, for everybody is interested in pushing it.

While the salesman must work his territory in such a manner that he makes a good living from it, he also must take care of all of the complaints that arise therein. As a rule the salesman becomes so well acquainted with his customers that they remember his name and call for him personally when telephoning the company to lodge a complaint.

Kitchen in Window Sells Electric Idea

A MODEL kitchen in the window is what M. M. Service at Porterville, Calif., put into its display recently. The refrigerator, range, kitchen table and window effects at the back gave the kitchen atmosphere to the display.

News of the Industry

Seattle and Tacoma Faced With Power Shortage Petition Navy for Use of "Lexington"

ALARMED by the shortage of electric power caused by unusually low water in the storage reservoirs on their respective municipal power systems, the cities of Tacoma and Seattle on Nov. 18 requested the United States Navy to lend the electrically driven airplane carrier "Lexington" to supply the deficiency. Under the plan proposed, the "Lexington" would have been anchored in the Tacoma harbor and its 180,000-hp. plant tied in with the local distribution system, which in turn could be tied in with the Seattle system.

The Navy originally denied the request on the ground that the frequency of the ship's generators is only 50 cycles while that of the municipal generators is 60 cycles, but later ordered the ship, which had sailed from Bremerton to join the battle fleet, back into Puget Sound, and as this magazine goes to press the "Lexington" is lying at anchor off Blake Island awaiting further instructions. In the meantime, municipal power department officials of Seattle and Tacoma and Navy department officials in Bremerton have joined in a conference to determine the most feasible plan for supplying power to the two cities.

A grave situation confronts both cities. Although the normal rainfall for Seattle is approximately 34 in. per year, since the first of this year the deficit is 11 in., so that streams show the lowest flow on record at this time. The full hydro capacity for western Washington is 329,500 kw. and the steam capacity 116,000 kw., but it is reported that under present conditions hydro stations are carrying a peak load of 190,000 kw. only and the steam stations a peak of 114,000 kw.

Cold weather and drought have so reduced the Tacoma hydro supply from the Cascade Mountains and the supply from the Olympia Range through the Cushman plant that one large industrial plant outside the city limits has been shut down on account of power shortage and power for other industrial plants has been curtailed. Street lights have been reduced in Tacoma and residents have been co-operating during the power shortage by temporarily discontinuing the use of electric toasters, heaters and other electrical equipment.

J. D. Ross, superintendent of the Seattle City Lighting Department, in confirming the report that Seattle had joined Tacoma in a request to the Navy for 20,000 kw. from the "Lexington" for the duration of the shortage, stated on Nov. 20 that Tacoma's Lake Cushman, with a storage capacity of 60,000,000 kw.-hr., had 6,000,000 kw.-hr. or less remaining, and that Seattle with 5,000,000 kw.-hr. storage at Cedar Lake, had 3,000,000 left, but that the peak capacity was ample. Mr. Ross explained that the two cities were intertied for 15,000 kw. and had pooled their resources, and that the daily requirements of 1,750,000 kw.-hr. were being met as follows: One-half by steam power, of which 35,000 kw. is being supplied from Seattle, and 6,000 kw. from Tacoma, 250,000 kw. from storage, and the remainder from stream flow.

Commenting on the situation, R. M. Boykin, manager, Puget Sound Power & Light Company, Seattle, said: "The Puget Sound company, experiencing a shortage of water a year ago, built a 40,000-kw. steam station, giving it 72,000 kw. of steam capacity to care for just such an emergency. By June this capacity will be increased to 112,000 kw. of steam, resulting in better balance between hydro and steam. The company is at present carrying 65 per cent of the total western Washington load, and while our storage basins are being drawn on, we are in no danger as yet as far as peak capacity and kilowatt-hours are concerned and are in a position to render service to such customers as the cities of Tacoma and Seattle may sever from their systems. Our steam is supplying 37 per cent of cur peak capacity and 66 per cent of kilowatt-hour output. With approaching winter and colder weather precipitation in watersheds is likely to be snow, causing limited runoff and reducing hydro output still further. Consequently little relief is in sight and prospects are not bright."

[Although no precedent may exist for the turning over of a battleship to a municipality as a power plant, there is nothing new about utilizing floating supports for emergency power plant installations in the Northwest. The City of Longview was served with power for some months in 1924, prior to the completion of the Long Bell Lumber Company's steam plant at the mill site, by a 1,500-kw. turbogenerator, mounted with its oil burning boilers on a barge moored in the Columbia River adjacent to the mill site. (Journal of Electricity, May 1, 1924, p. 335.) In December, 1924, a 150-kva. generator with its McEwan engine drive, mounted on the tug *Roosevelt* and served with steam by the tug's boilers, served emergency power to the Puget Sound Power & Light Company's customers on Vashon Island in Puget Sound pending repairs to the submarine cable running to the island from the mainland. (Journal of Electricity, Oct. 1, 1925, p. 250.)

In this connection, it is further interesting to recall that in the latter part of the year 1879 a circuit was run from the arc light generator of the steamship *State of California* while the ship was moored to a dock in the Willamette River, Portland, and an arc light was hung on the corner of First and "S" (now Flanders) St., Portland, to demonstrate this new form of electric lighting to an incredulous people. Authority for this fact is found in an article soon to be published in the *Oregon Historial Society Quarterly* on the history of the electrical power industry in Portland, by O. B. Coldwell, vice-president, Portland Electric Power Company.—Editor's note.]

Market Break Not Affecting 1930 Construction Plans

That the recent stock market break will have no curtailing effect upon proposed construction and expansion programs of utility companies in the Western states is clearly indicated in statements regarding the situation just received by the McGraw-Hill Company of California from the operating heads of many of those companies and from consulting engineers in three Pacific Coast cities. In almost every instance the light and power companies in this section will spend more money on plant construction in 1930 than they have spent in any year previous.

A digest of the statements follows.

O. B. Coldwell, vice-president and general manager, Portland Electric Power Company, Portland:

"We expect to maintain our construction program during 1930. Expenditures for the year are estimated to exceed by a considerable margin those of 1929."

A. W. Leonard, president, Puget Sound Power & Light Company, Seattle:

"This company's construction program for 1930 contemplates normal expenditures, which will be somewhat less than in 1929 due to completion of the 50,000-hp. Shuffleton steam plant this year. However, 1930 construction expenditures will be somewhat above the average."

W. C. Morse, consulting engineer, Seattle:

"There is no sign of any diminution in either public or private construction in this district resulting from the present national situation. There is, on the other hand, a seemingly strong growing belief that after the first of the year money will be more readily available for conservative, well balanced construction in this district than it has been for some time past. This is particularly true of public improvements, payment for which must come from bond issues."

R. H. Ballard, president, Southern California Edison Company, Los Angeles:

"The Southern California Edison Company's new construction budget for 1930 calls for an expenditure of $23,488,662 as against an expenditure of $18,000,000 this year. The company's principal expenditures in 1930 will be for distribution extensions and reinforcements for new business

amounting to $17,863,662, completion of a new 133,000-hp. unit at Long Beach steam plant, to cost $2,050,000, and a new office building to be finished in 1930 requiring $3,575,000. Gross revenues for 1930 are expected to be approximately 10 per cent over those for 1929."

Col. Charles T. Leeds, Leeds & Barnard, consulting engineers, Los Angeles:

"Present national situation has had no apparent effect on either public or private projects with which our firm is concerned. We believe the resulting hysteria may produce a retarding effect, but sane interests should and will proceed with such projects as have a sound basis."

A. F. Hockenbeamer, president, Pacific Gas and Electric Company, San Francisco:

"Our construction expenditures for this year will total about $34,000,000 and present plans call for expenditures next year of $35,000,000, toward which $24,000,000 already has been realized from our recent sale of securities."

H. J. Brunnier, consulting structural engineer, San Francisco:

"In recent months building construction was being slowed up by stock market activities. Since the break in the market, however, there is considerable optimism and a general opinion that before the middle of next year there will be a large amount of building activity."

California Railroad Commission Reduces Rates of Southern Sierras Power Co.

THROUGH an order issued on Nov. 5 by the California Railroad Commission on the application of The Southern Sierras Power Company, Riverside, Calif., for a revaluation of its properties and an adjustment of its rates, filed more than four years ago, a reduction in rates amounting to approximately $300,000 a year became effective Dec. 1.

In its decision the commission pointed out that there were indications that the company's application was directed not so much toward the establishment of proper rates as toward having the commission make a finding of value of its properties useful to the company for purposes of financing, and other ends. When this became apparent, it is pointed out in the decision, the commission instituted its own general investigation into the rates of the utility.

The commission declared that it is significant that during the long-drawn-out pendency of the proceeding, through which the company sought certain rate increases, economic conditions and competition forced the company to make four voluntary reductions of its rates amounting to $175,000, $90,000, $2,000 and $5,000, respectively.

The commission held that in view of all the circumstances presented by the case, its duty would be fulfilled if it fixed non-discriminatory and reasonable rates for the entire system of the utility. The reduction amounts to approximately 14 per cent in the domestic and commercial lighting schedules on the system as a whole, but the Imperial Valley area will benefit much more than elsewhere through the drastic reduction of a number of rate schedules showing more or less discrimination.

The rates in the competitive area of the utility are not altered, as they are the same as those of the Southern California Edison Company. This area is roughly San Bernardino, Riverside and Arlington. The reduction in its northern division is approximately 10 per cent.

Commenting on this phase of the proceeding, the commission states:

"The evidence shows that, owing to low rates, brought about by competition with the Southern California Edison Company in and around the central area served, the company collects higher rates than are warranted from consumers in its northern and southern territories. This is particularly true of lighting and industrial power rates in the Imperial Valley, which are from 50 per cent to 100 per cent above rates charged for similar service in the competitive area. While some differential in rates is warranted the extreme difference above noted can by no means be justified."

In regard to the method of removing these discriminations, the opinion contains the following statements:

"The rate structure of the company discloses various locality and class discriminations violative of the provisions of the Public Utilities Act. The schedule here approved will remove these. In accomplishing this result no rates are increased, the removal of discriminatory rates being effected by a process of reduction of the higher rates to the level of those voluntarily established rather than by increasing the latter.

"A consideration of the whole record justifies this method of removing existing discriminations rather than its converse, for with economical management the rates established in this order should, in the future, and on the average, yield a reasonable return upon the property devoted to the public use."

The Southern Sierras company in filing a petition for a rehearing has challenged the legal right of the Railroad Commission to regulate electric rates outside of California, which it is charged was done contrary to the constitution of the State of California, in the commission's recent decision.

The petition also alleges that the commission made errors in its method of arriving at valuations and in its decision establishing rates which would be confiscatory and violative of the state and federal constitutions; that there are not sufficient findings by the commission relative to property valuations, depreciation, new property that has been put into public use since June 30, 1928, or consideration for reductions in rates already made by the company during the latter part of 1928, to justify so great a rate slash; that there is no evidence that the present rate structure shows discrimination, as alleged, and that it is unfair to charge such discrimination for the reason that the commission itself made the original rates and has approved changes made since; that the commission's decision seeks to make reductions retroactive by specifying that they shall be effective for meter readings on Dec. 1, which would cover a period in November prior to the date of the decision; that the decision will require the taking of the property of The Southern Sierras Power Company for public use without just compensation; that in establishing the new rates the commission has not taken into consideration all of the factors relating to operating costs and taxes, depreciation, a reasonable return on a fair valuation of the properties and upon all items, including hydro-electric land and water rights, materials and supplies and working cash capital; that there is no evidence in the record of the proceedings that have been held to justify the conclusion that the rates authorized by the decision are compensatory and reasonable; that the commission in appraising the property of the company has left out many important items, which should properly have been included, and that on the basis of leaving these items out of a fair valuation of the property devoted to public service, the company would receive a return of only 4.329 per cent.

It is the contention of officials of the company that if the proposed new rates go into effect the company will be handicapped in making betterments and extensions and that the decision would be confiscatory in its effect.

P.G. & E. and Great Western Re-Valuations Denied

Petitions filed by the Pacific Gas and Electric Company and the Great Western Power Company of California for rehearing of the commission's decision fixing the valuation of the companies' electric distribution properties within the City and County of San Francisco, have been denied by the California Railroad Commission.

In its decision the commission fixed the valuation of the properties of the Pacific Gas and Electric Company at $26,685,000 and of the Great Western Power Company at $11,815,000. The P.G. and E. Co. had evaluated its property at approximately $60,000,000, and the Great Western company had set the value of its holdings at $30,000,000. (Electrical West, July 1, 1928, p. 40.)

Arizona to Carry Boulder Dam Controversy to United States Supreme Court

NEGOTIATIONS looking toward an agreement between Arizona, California and Nevada in the Boulder Dam power allocation controversy were abandoned definitely at a recent meeting of the Arizona Colorado River Commission in Phoenix. The commission's decision came as a direct result of the receipt by Governor Phillips of a notice from Secretary Wilbur that Arizona had been allotted 18 per cent of the power to be generated at Boulder Dam. A suit is to be filed immediately in the United States Supreme Court by the State of Arizona to test the right of Congress to allocate Colorado River water and Boulder Dam power. Notification of the commission's action was sent at the close of the meeting to Col. W. J. Donovan, chairman of the tri-state conference.

Reasons for Arizona's action, as announced in a statement issued by the Colorado River commission following its two-day meeting, may be summed up as follows:

1. Southern California wants practically all of the available water in the river for irrigation purposes in the Imperial, Coachella and other interior valleys and for use on the coastal plain. For Arizona to concede these demands "would mean that new developments made possible by the project would take place in California, and none in Arizona."

2. For some time "it has been evident that California wanted to get the matter of power and water contracts completed with the Secretary of the Interior before seeking a compact with Arizona, thus removing power and water revenues as subjects of negotiation."

3. The Imperial and Coachella valleys are to receive water for irrigation and other purposes "without paying anything whatever to the project. No such gratuity is extended to Arizona."

4. It was generally understood California would be expected to pay approximately $1.50 per acre-ft. storage and delivery charges for water diverted to the coastal plain. "We requested a minimum charge or $2. California asserted it could not be more than $1. The Secretary of the Interior now proposes a charge of only 25 cents."

5. The project was "intentionally placed at the nearest available point to the California power market and the most remote from the Arizona power market."

6. In its present form and purpose, "our commission is advised and is firmly of the belief that the Swing-Johnson Bill is unconstitutional."

7. "The United States is to advance upwards of $40,000,000 without interest to enable Imperial and Coachella valleys to vastly increase their appropriation and use of the waters of the river. No provision is made for any such aid to Arizona.

8. "When the project is fully paid for, Arizona's right to share in the revenues thereof ceases."

9. "Under the terms of the Swing-Johnson Bill, Arizona was intended to be a beneficiary of the project to the extent of 18¾ per cent of 'excess revenues,' that is to say, revenues received in excess of the amounts required for operation, maintenance and repayment of the government advances.

"The proposal of the Secretary of the Interior for the nominal charge of 25 cents per acre-ft. for storage and delivery charges of waters delivered to the coastal plain, runs counter to the apparent intent of Congress that the project should be so operated as to produce substantial revenues for Arizona and Nevada. With such nominal charge for that water, any hope that Arizona might actually receive substantial revenues from the project is completely wiped out."

Regarding power, the commission found that "experts from nearly all of the large users of power in Arizona, outside of Mohave County, have closely studied the matter and reached the conclusion that by reason of prohibitive transmission costs and the relatively small demand, Boulder Dam power cannot, under present conditions at least, be used by any of the large consumers in Phoenix or the large mining camps of eastern and southern Arizona."

Washington Conference

Confronted with the threat of litigation by Arizona that would suspend work on the Boulder Dam project until the U. S. Supreme Court rules on the constitutionality of the act, the conference of the other beneficiaries held Nov. 12-13 in Washington produced little but a restatement of their conflicting demands.

The Southern California Edison Company protested that the proposed division of power is inequitable and unfair to the customers of the public utility companies and contrary to the public interest. While the company is in entire accord with the plan to make available to the Metropolitan Water District all the power needed for pumping water into the Colorado River aqueduct, the company objects to the plan to make the district a direct and principal contractor. To give the district a direct allocation and contract for either a definite or indefinite power would result inevitably, the Edison company's spokesmen argued, in the expansion of the district's activities to include power distribution to its particular cities.

The proposal to have the price readjusted upward or downward at the time of completion of the dam was declared unacceptable to the Southern California Edison Company because of the serious obstacle to financing the necessary expenditures for power machinery and transmission lines in the face of the possibility of a greatly increased price for power. The company interprets Secretary Wilbur's proposal of Oct. 21 ("Electrical West," Nov. 1, 1929, p. 260) as meaning that the board of control to be created would be actually in charge of the operation of the power plant and that this board would employ the plant manager and other employees who would run the plant. It is also the company's understanding, as stated at the hearing, that if a contract is entered into by the government with the Southern California Edison Company that contract is to be made directly with the Secretary of the Interior and not with the City of Los Angeles and the Metropolitan Water District, as the term "sub-contract" used in Secretary Wilbur's statement would imply. The company mainitained that the contract with it should be on a parity with the contract to be made with the city.

The proposals presented at the hearing by the spokesmen for the City of Los Angeles and the Metropolitan Water District were as follows:

The city should be designated as the sole agent in charge of operation of the power plant and the main transmission lines.

If allocation of power without a hand in control is not acceptable to the private companies the city can use it and is able to pay for it.

The government should build the plant and install the machinery.

The proposed board of control should function only in an advisory capacity and should be recast to include one representative of the private companies, one of the City of Los Angeles, two of the Metropolitan Water District and one or more of the government.

The dam should be erected to the greatest height feasible.

The arguments presented on behalf of the City of Los Angeles were endorsed by officials of the small municipalities. They were represented by B. F. DeLanty, general manager of the Light and Power Department of Pasadena; H. E. Bruce, mayor of Burbank; and C. E. Kimlin, mayor of Glendale. They protested that the allocation of 4 per cent tentatively allotted to them would be too small to justify the expense incident to transmission and wholly inadequate to meet their needs.

W. C. Mullendore, general attorney for the Southern California Edison Company, declared that the proposals made on behalf of the City of Los Angeles would discriminate against the rural communities depending upon the private company.

Spokesmen for the State of Nevada reiterated their demand for allocation of one-third of the power developed by the dam, representing that the allocation of 18 per cent proposed in Secretary Wilbur's statement made the interests of that state subservient to those of municipal and private interests. They also contended that until such time as this power is required in the industrial development of the state that it should be permitted to sell it outside of its boundaries.

Meeting of Upper Basin States

The conference of the four upper Colorado River basin states (Colorado, Wyoming, Utah and New Mexico), scheduled to be held in Denver on Nov. 6, was postponed and now is set for Dec. 3 in Denver. The purpose of the conference is the apportioning among the four states of the share of water allotted the upper basin.

Couzens Bill Opposed by Montana Commission

Declaring itself emphatically opposed to the amended Couzens Bill proposing federal regulation of interstate utility operation, the Public Service Commission of Montana on Nov. 5 passed a resolution setting forth its objections in detail. Excerpts from the resolution follow:

"This board desires to herein stress its objections to federal usurpation of the state's regulatory powers by the enactment of this proposed legislation, or any other similar legislation which, in our opinion, would not only weaken but would practically destroy state control of such utilities. We feel, and emphasize our deductions after a care-

ful analysis of this measure, that the effect of such federal legislation would be to deprive the sovereign states of the exercise of their powers, which we look upon, and should be recognized as, a permanent attribute to the inherent rights of the people within their borders. We respectfully submit that there is absolutely no need for the creation of a 'Commission on Communications and Power,' and further submit that the state bodies now established and functioning are amply qualified to assume any additional supervision and control if such is found to be necessary at this time. In our opinion nothing would more quickly lead to a callapse of state sovereignty than to deny the people the right to control public utilities that serve them locally.

"The final result . . . is the loss by the states and by the utility commissioners as state officials of all the effective authority they now exercise over telephone companies and the loss of part of and confusion as to the remainder of their control over electric rates.

"An inherent fault in the scheme of this bill lies in its attempt to apply to these utilities the regulatory system adopted for the railroads. The difference in condition makes the plan impracticable. Eighty-five per cent of railroad business is interstate. Only the federal government has the authority to regulate it, and having thus far the largest interest there is some propriety in its assumption of domination as to all. But the situation of these utilities is the reverse. Here the interstate feature is a negligible fraction of the total. It is not in the public interest that the federal government should use it as a handle by which to attempt to control the whole, nor is it practicable to do so. The regulatory government made for the railroads will not fit the other utilities.

"Be it therefore resolved, that for reasons herein set forth briefly, our representatives in the Congress be appraised of this board's attitude in the premises, to the end that the legislation herein proposed be not favorably considered."

Protest against the pending bill has been lodged in a letter from the Colorado Public Utilities Commission to U. S. Senators Phipps and Waterman of Colorado. The communication states that the Colorado commission recognizes "economic changes in certain utilities may make federal regulations necessary in order that the public interest be protected," but adds: "In our humble opinion the time has not yet arrived when a federal commission should be charged with the regulation of telephone and electric service."

Further, the letter states: "In view of the effect that the enactment of such legislation as provided in the Couzens Bill would have on state legislation, may we not urge you to give this particular bill your serious consideration, with a view to retaining for the states as much local self-government as possible."

The Colorado commissioners hold that radio, cable and telegraph are interstate in character and can properly be regulated by a federal commission, but that electric and telephone utilities are in a different classification and should be left under local control.

Colorado Utilities Must File Extension Policies

A new ruling by the Colorado Public Utilities Commission provides that all electric utilities in the state must file a full statement of their present service extension policies and regulations applying to extensions in contemplation. The utilities body was to have sent out 250 notices early in November, demanding compliance within thirty days.

In the tentative order submitted to companies the commission proposes that:

Every company shall file with the commission a full statement of its extension policy.

No consumer can be required to advance money for extension of service except in accordance with such stated policy.

Advance payments from consumers shall not exceed the cost of the extension specifically contemplated.

If an estimated cost is necessary for collections in advance, the amount shall be adjusted promptly after construction is completed.

The utility may construct additional extensions at any time at its own expense.

The amount to be paid by consumers shall not include transformers, lightning arresters or other recoverable property or protective equipment except as to labor and hauling cost of installation.

Allowance shall be made to the consumer of amounts equal to the amount the utility would spend for obtaining new business.

Provisions shall be inserted in contracts with consumers that the extension is to become the property of the utility on completion and is to be maintained, controlled and operated by it.

Similar provisions will be made for privately owned lines connecting with a utility line, to the point of connection.

When it is not feasible to meter a consumer on a privately owned line at this connecting point because of cost of primary metering, the secondary metering records shall be adjusted to take reasonable account of the line and other losses between the meter and that point.

Pacific Power & Light's New Wallowa River Plant

BEFORE a considerable number of local citizens, with operating engineering and construction officials of the company present, this new 1,250-kva. hydro-electric lant at Joseph, Ore., on the Wallowa River, was dedicated Nov. 2 by the Pacific Power & Light Company. Miss Maxine Elliott, daughter of a local banker, was sponsor at the dedication ceremonies, at which company officials explained the operation of the plant to the assemblage. The ceremonies were concluded the same evening at a banquet tendered by the company to 150 local citizens, when the full significance of the event was explained by L. A. McArthur, vice-president and general manager; H. H. Schoolfield, chief engineer; E. V. Lorenz, construction superintendent; and C. M. Sanford, assistant general manager. Other speakers were Rev. M. J. Breen, representing the local community, and Berkeley Snow, Northwest editor, "Electrical West." R. L. Forsythe, district manager for the company at Enterprise, acted as toastmaster.

The plant more than doubles the generating facilities of the Enterprise (Ore.) district of the Pacific Power & Light Company in the Wallowa Valley.

Service for the district, which comprises the towns of Joseph, Enterprise, Lostine, and Wallowa, and surrounding rural territory, is now and has for some years been supplied by the Wallowa Falls hydro-electric plant about a mile above the head end of Wallowa Lake and some six miles above the new development. This plant will continue to be used as the base plant for the district and the new plant will carry the growing peak and be used for stand-by service.

Load-Building Rate Put in Effect in Cheyenne

A load-building, or promotional, rate has been inaugurated by the Cheyenne Light, Fuel & Power Company at Cheyenne, Wyo., with a view to encouraging increased use of electric appliances.

All domestic customers of the company, save only those who used the minimum, will be benefited by the reduced schedule. Municipal rates will remain as before, but the new rate on commercial lighting shows a reduction to 8½ cents for the first 60 hours' use of connected load, 7 cents for the next 60, 5 cents for the next 60, and 3 cents thereafter.

The former domestic schedule was 11 cents per kw.-hr. for the first 50 kw.-hr. and 10 cents for each kilowatt-hour thereafter, with no fixed charge. The new rate calls for a fixed charge of $1 a month for a six-room house, with 15 cents added for each additional room, but the rate for current used is only 5 cents per kilowatt-hour for the first 50 kw.-hr. and 3 cents per kilowatt-hour thereafter.

The 5-cent schedule went into effect with the November meter readings. On a basis of normal consumption, Cheyenne will save approximately $20,000 per year under the promotional schedule. However, this loss of revenue is regarded by company officials as temporary, as it is expected customers will avail themselves of additional appliances which can be used economically with cheap power.

Lake Kootenay Project to Be Investigated

Investigation by engineers of the project on Lake Kootenay proposed by the West Kootenay Power & Light Company of British Columbia has been ordered by the International Joint Commission following a hearing held at Bonners Ferry, Idaho. At the hearing the Canadian power plans were considered in the light of protests by Idaho farmers that raising of the Lake Kootenay water level would result in inundation of diked and reclaimed lands in northern Idaho.

After hearing testimony from Robert Crowe, counsel for the West Kootenay Power & Light Company, and from interested American individuals, the commission denied permission for immediate development and ordered engineers to investigate possibility of damage to American lands by the British Columbia company's power project. Authorization was given for the excavation for the dam as it was declared preliminary work will not affect the lake level. American interests asked that the final decision be postponed for a year to allow the land owners opportunity to investigate probable effects of the projects. The commissioners agreed that definite data relative to possible damage to Idahoans must be secured before final decision can be reached.

V. H. Greisser, chief engineer, The Washington Water Power Company, and L. R. Coffin, district manager, Puget Sound Power & Light Company, Wenatchee, testified that construction of the dam in Kootenay Lake will give a better all-year-round flow of water in the Columbia River for power purposes.

Members of the International Joint Commission are former United States Senator Fred Dubois, of Idaho; George W. Kyte, former member of the Dominion Parliament from Richmond, Nova Scotia; John H. Bartlett, former governor of New Hampshire, and chairman of the American section; C. A. Magrath, former member of the Dominion Parliament from Medicine Hat, Alta., present Ontario hydro chairman, and chairman of the Canadian section; Sir William Hearst, former premier of Ontario, and former United States Senator P. J. McCumber, of North Dakota.

Monument Erected to Pelton Water Wheel Inventor

TO MARK the place where Lester A. Pelton perfected his famous hydraulic invention of 1878, this monument has been erected in the mining town of Camptonville, Calif., on the site of his workshop. The monument is of concrete, 11 ft. high, and is surmounted by one of his early type of waterwheels. A bronze tablet on the face of the shaft reads, "On this spot in 1878 Lester Allen Pelton invented the Pelton Water Wheel—Erected 1929 by Gravel Range Lodge No. 59, Free and Accepted Masons." The tablet was donated by W. M. White, manager of the hydraulic department, Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

Centralia's Power Project Again Legally Halted

The hydro-electric power project proposed for development on the Nisqually River by the City of Centralia, Wash., has struck another legal snag as a result of a temporary writ of prohibition issued by the Lewis County court ordering the city to refrain from making effective a proposed ordinance declaring an emergency appropriation of $676,423 in the 1930 budget. The injunction suit in which the writ was issued had been filed by H. M. Jones, a taxpayer and an employee of the Eastern Railway & Lumber Company, which now sells lighting to the city.

The voters of Centralia twice have approved construction of the project, the second vote having become necessary when the State Supreme Court declared the first election invalid. More than one-half of a nine-mile diversion canal and two-thirds of the diversion dam and intake works for the project have already been built. The plant will produce 11,000 hp. if completed.

Pepco Hearing Opens and Adjourns Until Dec. 2

The long looked for hearing on the valuation and rates of the Portland Electric Power Company opened in Portland on Nov. 12 before the Oregon Public Service Commission with Frank R. Miller, chairman, presiding. Adjournment was taken Nov. 13 until Dec. 2 to permit the commissioners to attend a railroad case in San Francisco.

The first two days were consumed in direct examination of J. P. Newell, consulting engineer, and C. R. Lester, chief engineer of the commission, who submitted testimony on the valuation of the company. No time has yet been found for cross-examination of the witnesses or for presentation of testimony on the part of the city or the company.

The company's application to increase its street car fare from 8 cents to 10 cents is to be heard following the hearing on the power and light rates.

El Paso Electric Company Reduces Rates

New rate schedules applicable to commercial, industrial and residential customers were put into effect recently by the El Paso Electric Company, El Paso, Texas.

A home lighting rate has been established for limited use, the top step being reduced from 10 to 9 cents per kw.-hr. A new home service rate that is optional has been designed for unlimited use, which will eliminate the necessity of two meters where customers use both lighting and heavy-duty appliances.

New rural rates have been established that are of the same type as those in El Paso.

California Dam Inspection Act Upheld in Decision

The constitutionality of the California Dam Inspection Act, passed by the 1929 Legislature, has been upheld by the Third District Court of Appeal in a decision handed down Oct. 25 in favor of Bent Brothers, Inc., contractors who are building the flood control dam on the Calaveras River for the City of Stockton.

Bent Brothers had petitioned for a writ of mandate to compel J. P. Campbell, city auditor, to issue a warrant for $70,724 in their favor to cover work done by them under revised plans as ordered by Edward Hyatt, state engineer, under authority of the State Dam Inspection Act. The court ordered the writ issued.

In rendering this decision the appelate court declared the State Dam Inspection Act is "not only a proper but a necessary exercise of the police power of the state in the interest of protecting life and property." The court pointed out that while the state engineer has not the right to impair the obligations of contractors, "he can maintain suits to prevent the contract being so performed as to create a menace to life and property."

The St. Francis dam disaster in Los Angeles County two years ago was cited by the court as "emphasizing the need of such legislation" as the dam inspection act, which the court declared to be valid in all its essential details.

New Rate Schedule Adopted by City of Los Angeles

The City Council of Los Angeles has approved a new rate schedule for consumers of the Los Angeles Department of Water and Power, which is to go into effect Jan. 1, 1930. Under this new rate schedule the domestic consumer will pay 4.8 cents per kw.-hr. for the first 35 kw.-hr. consumed in any one month, for dwellings having five or less lighting circuits, and for 5 kw.-hr. per lighting circuit for each circuit in excess of five. For the next 140 kw.-hr. consumed in any one month, 2.5 cents per kw.-hr. will be charged, and for all in excess thereof consumed in any one month, 2 cents per kw.-hr. A minimum monthly charge of 60 cents shall be made in all cases except the following:

In the case of air heating for the home, when the rated capacity therefor is in excess of 10 kw., the minimum monthly charge shall be 50 cents per kilowatt of total such capacity.

This minimum charge for space heating is made cumulative over the twelve-month period by the new schedule.

A standard lighting circuit under the classification as described by the Department of Power and Light of the City of Los Angeles has a capacity of 660 watts.

Commercial lighting rates also are reduced in the new schedule. The first block of 100 kw.-hr. is dropped from 4¾ cents per kw.-hr. to 4½ cents per kw.-hr.

The first block of 100 kw.-hr. for industrial power has been dropped from 4.5 cents to 4.3 cents, with the next 400 kw.-hr. at 3.5 cents and the next 1,000 at 2.3 cents, and then by successive steps until all in excess of 100,000 kw.-hr. are at 0.0087 cents per kw.-hr.

The new rate schedule carries with it a power factor discount which reads as follows:

> Upon application, consumers having an operating demand of 200 kw. or more and who maintain an average power factor during the month in excess of 75.0 per cent lagging, shall be allowed a discount on the total month's bill, under the load factor rate, of 0.3 per cent for each 1.0 per cent that the monthly average power factor exceeds 75.0 per cent to and including 85.0 per cent, plus 0.2 per cent discount for each 1.0 per cent that the monthly average power factor exceeds 85.0 per cent with a maximum discount of 6.0 per cent for unity or leading power factors.

New Provo Store of Utah Power & Light Co.

OPEN HOUSE was held by the Utah Power and Light Company at its newly remodeled store and office in Provo, Utah, when the establishment was formally opened to the public recently.

Work had been under way for several weeks on the reconstruction and remodeling of the building, and the finished product represents one of the finest establishments of its kind in the Intermountain country. Additional space has been acquired, making the quarters much larger, with a commodious area in the front of the store for displaying electrical merchandise. The offices are in the rear section of the new store and are so arranged as to give the maximum of convenience. A new front adds materially to the attractiveness of the store, with large space for window display purposes.

MacRae's Blue Book in New Edition

The new 1929 edition of MacRae's Blue Book and Hendricks' Commercial Register recently made its appearance.

This compendium of information for the buyer in the railroad and public utility fields contains 2,644 pages and is divided into three sections: Address and local distributors' section (including advertisers' index), classified material section, and trade name section.

This simple arrangement makes the book a convenient, as well as reliable, source of information for the buyer. The address of any company may quickly be found by turning to the alphabetically arranged address and local distributors' section; the name of the manufacturer of any specific product is given in the classified material section; or if only the trade name is known, the name of the manufacturer may readily be found by consulting the trade name section.

Copies of MacRae's Blue Book may be obtained on the Pacific Coast from W. J. McCamman, 1202 Hearst Building, San Francisco. The price is $10; two-year subscriptions (including 1929 and 1930, or 1930 and 1931 issues) $15; 10 cents discount for cash, and carrying charges prepaid when cash accompanies order.

Eastern Oregon Co. Makes Voluntary Rate Reduction

A voluntary reduction in commercial lighting and domestic lighting and cooking rates of the Eastern Oregon Light & Power Company, Baker, Ore., amounting to from 33⅓ to 75 per cent on energy used in excess of 25 kw.-hr. was made effective Oct. 1. All the incorporated towns in the company's territory are affected, with the principal savings occurring in towns other than Baker and La Grande, Ore.

Formerly the domestic lighting rate was 100 kw.-hr. at 12 cents, with successive steps down to 5 cents. In addition, the domestic cooking rate on a separate meter was 50 kw.-hr. at 3½ cents, with the remainder at 3 cents.

The new combined lighting, cooking, heating and residence power schedule offers the first 20 kw.-hr. at 12 cents, the next 20 at 8 cents, with all over 40 at 3 cents, and permits present customers using cooking service to take their combined requirements on this schedule through one meter. For customers using water heating there are additional lower steps at 2 cents and 1½ cents. Reductions are also effected in the commercial lighting schedule.

FINANCIAL NEWS

1929 Gross Earnings of Edison Co. Estimated

Gross earnings of the Southern California Edison Company for 1929 will be $5,219,000 more than the total of $35,281,000 for 1928, according to a forecast made by R. H. Ballard, president of the company. The gain is about $2,000,000 more than was anticipated at the first of the year. In making this forecast, Mr. Ballard pointed out that the $40,500,000 1929 gross total takes into consideration the company's voluntary reduction of 10 per cent in lighting rates, and in the wholesale rate which it made effective to the City of Los Angeles as of Nov. 1. A similar reduction in industrial rates for the system goes into effect Jan. 1, 1930.

"The company will continue to maintain its position of ability to serve all demands of southern California," said Mr. Ballard, "and with the settlement of the Boulder Canyon power question on the co-operative basis, one may express no other opinion than that the next ten years will be a decade of great prosperity for the southern California community as a whole, and the company as well.

"The past decade has been one of remarkable electrical development, particularly in this territory. The company's expenditures for increased plant investment were over $218,000,000, an increase of 256 per cent for the ten years. The company's kilowatt-hour sales rose from 750,310,000 in 1920 to 2,493,000,000. In other words the sales of energy for the last year were 3⅓ times those of the year 1920. Gross earnings during the same period increased from $14,647,000 to $38,860,000.

"The present earnings in dollars are 2⅔ times those of the year 1920, as compared with 3⅓ times' increase in kilowatt-hour sales, demonstrating the effect of rate reductions during the period.

"The company's hydro-electric and steam-power generating plants have been enormously increased during this decade and they include some of the largest operating units in existence anywhere. The company's distributing lines have been extended to all parts of the territory served, and with the new uses to which electricity is being applied this territory has just begun to earn.

"The next decade should be one of continued remarkable electrical development, new industries and all classes of new consumers coming on the company's existing lines, and these lines will be freely extended as new territories may be developed.

"The sales feature will far outrun the investment requirements, since so much of the foundational investment in plants and lines is already made. This will result in larger proportional earnings, greater operating efficiencies, and further rate reductions to the consuming public from time to time."

Public Service Co. Adopts Budget of $4,673,000

The largest budget ever contemplated by the Public Service Company of Colorado for improvement and rehabilitation work has been announced by Clare N. Stannard, vice-president and general manager.

The amount to be spent totals $4,673,000 and was necessitated by greatly increased demands for electricity and natural gas. Mining revival in Colorado has added 5,000 to 6,000 hp. to company load, and a number of big installations in Denver, such as General Stone Company (1,200 hp.), Montgomery Ward & Company (1,000 hp.), the Ralston Purina Company (1,600 hp.), and several other smaller ones are contributing factors.

Coincidental with the release on budget figures, Mr. Stannard disclosed that the Public Service Company of Colorado established a peak of more than 1,000,000 kw.-hr. on Oct. 29. On the same day natural gas consumption in Denver reached a new high of 19,333,000 cu.ft.

A heavy percentage of the increased electric load falls on Valmont, the company's 65,000-hp. steam generating plant near Boulder, Colo. To pick up this added burden a new boiler costing $500,000 will supplement the Valmont equipment. Additions to outlying hydro and steam plants and an ambitious program on high-voltage tie lines constitute outstanding items on the 1930 schedule.

Approximately 20 per cent of the expenditure has been allocated to amplifying Denver service.

Coast Counties Gas & Electric Company Authorized to Issue $499,700 of First Preferred Stock—The Coast Counties Gas & Electric Company, Santa Cruz, Calif., has been authorized by the California Railroad Commission to issue $499,700 of an authorized issue of $500,000 of first preferred stock to the subscribers therefor for the purpose of validating the sale thereof to installment purchasers prior to the expiration date specified in the commission's original order. Similar action was also taken by the commission in regard to the issuance of $848,900 of an issue of $850,000 of preferred stock, and also in regard to the issuance of $400,000 of first preferred stock.

P. G. and E. Acquires Snow Mt. and Vallejo Utilities

The Pacific Gas and Electric Company has been authorized by the California Railroad Commission to acquire and hold all of the issued and outstanding stock of the Snow Mountain Water and Power Company, operating in Mendocino County, Calif., consisting of not exceeding $1,500,000 of 6 per cent cumulative preferred stock, and not exceeding $4,300,000 of common stock, and to issue $672,833.33⅓ of its common stock at par value, $25 per share, to the stockholders of the Snow Mountain Water and Power Company in payment for their stock, and to assume the outstanding liabilities of the company.

Permission is also granted to the Pacific Gas and Electric Company to purchase 4,583⅓ shares of the common capital stock of the Vallejo Electric Light & Power Company, and to issue 10,083⅓ shares of its common capital stock of an aggregate par value of $252,083.33⅓ in payment therefor.

The Pacific Gas and Electric Company has the commission's authorization to use $50,416.67 in cash derived in part from the sale of the Vallejo company's stock and $134,566.67 derived from the purchase of the Snow Mountain company's stock to reimburse its treasury in part on account of unreimbursed capital expenditures made prior to June 1, 1929.

W. B. Foshay Properties in Receivership

All the properties owned and managed by W. B. Foshay Company, of Minneapolis, and associated companies, valued at more than $20,000,000, went into receivership on Nov. 1. Involved in the crash were a number of utility companies of all kinds scattered throughout many states and including many properties in Alaska, in Ontario and Quebec, and in Mexico and Central America. Most of the companies are very small.

In the West the more important Foshay interests included the Public Utilities California Corporation with plants at Boulder Creek, Needles and Smith River, Calif., and the Central Mendocino Power Company, Willits, Calif., which was owned and operated by the Public Utilities Consolidated Corporation (Ariz.). This company also serves Chloride, Kingman, Nogales and Oatman, Ariz.; Burke, Mullen and Wallace, Idaho; Polson and Ronan, Mont.; Deer Park, Milan and Valley, Wash.

Edison Company May Reduce Selling Price of Stock—Permission has been granted by the California Railroad Commission to the Southern California Edison Company, Los Angeles, Calif., to dispose of the remaining 163,285 shares of its 5½ per cent preferred stock at $24 per share instead of at $24.50 per share as previously authorized for an issue of 1,276,715 shares.

Northwest Electric Light & Power Association

Association to Hold no Convention in 1930

According to action taken by the executive committee of the Northwest Electric Light and Power Association, there will be no general convention of the association in 1930. This decision was made in view of the fact that the national convention is to be held next June in San Francisco. There will, however, be an executive session of member company representatives of the association to elect officers and transact such business as generally comes before such meetings. Mid-winter conferences of the Accounting, Commercial and Engineering Sections will likewise be held, as has been customary.

The principal reason for eliminating the general convention in the year in which the national convention is held on the Pacific Coast is that the member companies desire to send larger delegations to the national convention than they are able to send when that convention is held in an Eastern city, and relief from the expense of sending many employees to a Northwest convention permits this.

Personnel for 1929-1930

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M. W. Birkett, Wash. Water Pwr. Co., vice-president.
R. B. King, Idaho Pwr. Co., vice-president for Idaho.
W. B. MacDonald, Mount. States Pwr. Co., vice-president for Montana.
J. P. Lottridge, East. Ore. Lt. & Pwr. Co., vice-president for Oregon.
P. M. Parry, Utah Pwr. & Lt. Co., vice-president for Utah.
Leslie R. Coffin, Puget Sound Pwr. & Lt. Co., vice-president for Washington.
R. M. Boykin, Puget Sound Pwr. & Lt. Co.
M. J. Wilkinson, Pacific Pwr. & Lt. Co.
J. F. Orr, Utah Pwr. & Lt. Co.
D. W. Proebstel, Portland Elect. Pwr. Co.
W. W. Briggs, Grays Harbor Ry. & Lt. Co.
A. C. McMicken, Portland Elect. Pwr. Co.
A. S. Moody, G. E. Co.
J. I. Colwell, Graybar Elect. Co.

OTHER OFFICERS

A. E. Janssen, Idaho Pwr. Co., treasurer.
Berkeley Snow, "Electrical West," secretary.

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John Ford, Mount. States Pwr. Co.
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L. D. Johnson, Portland Elect. Pwr. Co., chairman.

ELECTRICAL ADVERTISING COMMITTEE

H. C. McDaniel, Pacific Pwr. & Lt. Co., chairman.

HOME EDUCATIONAL LIGHTING COMMITTEE

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STREET AND HIGHWAY LIGHTING COMMITTEE

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Carl Hoffman, Wash. Water Pwr. Co.
Ted C. Reichardt, Rainier Elect. Ovens.
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Robert S. Overstreet, Idaho Pwr. Co.
E. R. Owen, Utah Pwr. & Lt. Co.
S. K. Pardee, Peoples West Coast Hydro-Elect. Corp.
L. H. Robinson, Northwestern Elect. Co.
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L. W. Going, Portland Dept. of Public Works.

C. R. Higson, Utah Pwr. & Lt. Co.
W. S. Hill, Grays Harbor Ry. & Lt. Co.
H. M. Jones, Idaho Pwr. Co.
H. A. Patton, Wash. Ins. Rating Bureau.
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F. O. McMillan, Ore. State College.
Harry Olsen, Calif. Ore. Pwr. Co.
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C. R. Higson, Utah Pwr. & Lt. Co.
L. H. Kistler, Northwestern Elect. Co.
T. W. Maclean, Wash. Water Pwr. Co.
F. C. Poage, Idaho Pwr. Co.
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METER COMMITTEE

A. H. Kreul, Portland Elect. Pwr. Co., chairman.
S. M. Bullis, Calif. Ore. Pwr. Co.
J. G. Finley, Wash. Water Pwr. Co.
R. M. Freeman, Pacific Pwr. & Lt. Co.
John T. Gray, Grays Harbor Ry. & Lt. Co.
L. H. Kistler, Northwestern Elect. Co.
O. D. Lanning, East. Ore. Lt. & Pwr. Co.
C. R. McLean, Mount. States Pwr. Co.
W. J. McMinn, Utah Pwr. & Lt. Co.
R. E. Thatcher, Puget Sound Pwr. & Lt. Co.
Howard Waterman, Idaho Pwr. Co.
J. L. Watson, Portland Elect. Pwr. Co.
Eldred W. Williams, Montana Pwr. Co.

OVERHEAD SYSTEMS COMMITTEE

T. A. Purton, Idaho Pwr. Co., chairman.
P. P. Ashworth, Utah Pwr. & Lt. Co.
J. B. Brokaw, East. Ore. Lt. & Pwr. Co.
A. B. Cayo, Portland Elect. Pwr. Co.
M. T. Crawford, Puget Sound Pwr. & Lt. Co.
R. S. Daniels, Calif. Ore. Pwr. Co.
R. J. Davidson, Pacific Pwr. & Lt. Co.
Ralph E. Gale, Idaho Pwr. Co.
L. R. Gamble, Wash. Water Pwr. Co.
Curtis L. Hill, Puget Sound Pwr. & Lt. Co.
D. A. Hord, Northwestern Elect. Co.
F. O. McMillan, Oregon State College.
A. C. Pratt, Montana Pwr. Co.
F. J. Robbins, Grays Harbor Ry. & Lt. Co.
Walter Smith, Mount. States Pwr. Co.
C. D. Wood, Calif. Ore. Pwr. Co.

PRIME MOVERS COMMITTEE

C. C. Simeral, Portland Elect. Pwr. Co., chairman.
H. S. Bastian, C. C. Moore & Co.
J. A. Hale, Utah Pwr. & Lt. Co.
W. S. Hill, Grays Harbor Ry. & Lt. Co.
John McEwell, Puget Sound Pwr. & Lt. Co.
W. C. McLagan, Mount. States Pwr. Co.
Thos. Perry, Northwestern Elect. Co.
W. A. Struthers, Portland Elect. Pwr. Co.
J. E. Yates, Pacific Pwr. & Lt. Co.

UNDERGROUND SYSTEMS COMMITTEE

C. H. Hoge, Puget Sound Pwr. & Lt. Co., chairman.
P. P. Ashworth, Utah Pwr. & Lt. Co.
S. B. Clark, Northwestern Elect. Co.
F. E. Fisher, Puget Sound Pwr. & Lt. Co.
J. M. Gillham, Portland Elect. Pwr. Co.
H. M. Jones, Idaho Pwr. Co.
F. L. Rohrbach, Wash. Water Pwr. Co.

PUBLIC RELATIONS SECTION

EXECUTIVE COMMITTEE

R. B. King, Idaho Pwr. Co., chairman.
W. H. Ude, Wash. Water Pwr. Co., vice-chairman.
L. R. Coffin, Puget Sound Pwr. & Lt. Co.
J. P. Lottridge, East. Ore. Lt. & Pwr. Co.
W. B. MacDonald, Mount. States Pwr. Co.
P. M. Parry, Utah Pwr. & Lt. Co.
(and the chairmen of the following committees)

ADVERTISING-PUBLICITY COMMITTEE

W. P. Strandborg, Portland Elect. Pwr. Co., chairman.
H. L. Bromley, Calif. Ore. Pwr. Co.
E. J. Crosby, Wash. Water Pwr. Co.
M. L. Cummings, Jr., Utah Pwr. & Lt. Co.
R. G. Foster, Puget Sound Pwr. & Lt. Co.
E. C. Kiersted, Idaho Pwr. Co.

CUSTOMER OWNERSHIP COMMITTEE

D. G. Tyree, Calif. Ore. Pwr. Co., chairman.
L. W. Brainard, Idaho Pwr. Co.
E. G. Jarvis, Portland Elect. Pwr. Co.
S. E. Skelley, Pacific Pwr. & Lt. Co.
G. B. Thomas, Utah Pwr. & Lt. Co.
W. H. Ude, Wash. Water Pwr. Co.
Dwight Ware, Puget Sound Pwr. & Lt. Co.

COMMITTEE ON CO-OPERATION WITH EDUCATIONAL INSTITUTIONS

R. M. Boykin,, Puget Sound Pwr. & Lt. Co., chairman.

COMMITTEE ON EMPLOYEES' RELATIONS WITH THE INDUSTRY

Col. H. G. Winsor, Puget Sound Pwr. & Lt. Co., chairman.

COMMITTEE ON EMPLOYEES' RELATIONS WITH THE PUBLIC

Dr. Adam S. Bennion, Utah Pwr. & Lt. Co., chairman.

COMMITTEE ON RELATIONS WITH FINANCIAL INSTITUTIONS

C. M. Brewer, Mount. States Pwr. Co., chairman.

PUBLIC SPEAKING COMMITTEE

George L. Myers, Pacific Pwr. & Lt. Co., chairman.
Adam S. Bennion, Utah Pwr. & Lt. Co.
George T. Bragg, Pacific Pwr. & Lt. Co.
H. L. Bromley, Calif. Ore. Pwr. Co.
Marguerite Butler, Portland Elect. Pwr. Co.
E. J. Crosby, Wash. Water Pwr. Co.
E. C. Kiersted, Idaho Pwr. Co.
G. H. Peets, Puget Sound Pwr. & Lt. Co.
R. C. Sipe, Mount. States Pwr. Co.
A. A. Smith, East. Ore. Lt. & Pwr. Co.

WOMEN'S COMMITTEE

Mrs. Gertrude McDevitt, Idaho Pwr. Co., chairman.
Mrs. A. W. Angell, Northwestern Elect. Co.
Marguerite Butler, Portland Elect. Pwr. Co.
Charlotte Cummings, Utah Pwr. & Lt. Co.
Estella Dorgan, Mount. States Pwr. Co.
Martha O. Goldapp, G. E. Co.
Edith L. Hedger, Wash. Water Pwr. Co.
Mildred Knight, Calif. Ore. Pwr. Co.
Mrs. Nell Laws, Puget Sound Pwr. & Lt. Co.
Esther Miller, Grays Harbor Ry. & Lt. Co.
Amy Villa, Idaho Pwr. Co.
Mary K. Walsh, Wash. Water Pwr. Co.
Loy Wisdom, East. Ore. Lt. & Pwr. Co.

GENERAL COMMITTEES

EDUCATIONAL COMMITTEE

Berkeley Snow, "Electrical West," chairman.
George T. Bragg, Pacific Pwr. & Lt. Co.
J. B. Brokaw, East. Ore. Lt. & Pwr. Co.
H. L. Bromley, Calif. Ore. Pwr. Co.
M. L. Cummings, Jr., Utah Pwr. & Lt. Co.
R. W. Faville, Northwestern Elect. Co.
E. C. Kiersted, Idaho Pwr. Co.
Z. E. Merrill, Mount. States Pwr. Co.
George Sullivan, Portland Elect. Pwr. Co.
W. H. Ude, Wash. Water Pwr. Co.
H. G. Winsor, Puget Sound Pwr. & Lt. Co.

INSURANCE COMMITTEE

L. A. McArthur, Pacific Pwr. & Lt. Co., chairman.

MEMBERSHIP COMMITTEE

Berkeley Snow, "Electrical West," chairman.
N. W. Brockett, Puget Sound Pwr. & Lt. Co.
J. B. Brokaw, East. Ore. Lt. & Pwr. Co.
H. L. Bromley, Calif. Ore. Pwr. Co.
W. E. Huddleson, Portland Elect. Pwr. Co.
E. C. Kiersted, Idaho Pwr. Co.
C. W. Lundquist, Utah Pwr. & Lt. Co.
Z. E. Merrill, Mount. States Pwr. Co.
B. H. Parkinson, Northwestern Elect. Co.
W. H. Ude, Wash. Water Pwr. Co.

P. C. E. A.

Great Western Power Co. Has Women's Committee

Under the chairmanship of Miss Marie Houlahan a women's committee has been organized in the Great Western Power Company of California, San Francisco, with 100 per cent membership of the women of the organization. A luncheon meeting is held each month and enthusiastic plans have been made for an active program during the winter. Miss Genevieve Teddy, of the Sacramento division office of the Great Western company, is vice-chairman of the committee.

Al. C. Joy, director of publicity of the company, was the principal speaker at the initial meeting of the committee in October, and at a second meeting, held on Nov. 27, H. K. Fox, construction engineer, spoke on the newly completed 25,000-kw. steam plant at India Basin, San Francisco.

Meetings

Coming Events

American Institute of Electrical Engineers, Pacific Coast Division—Annual convention, Portland, Sept. 2-5, 1930.

National Electrical Wholesalers Association, Pacific Division—Annual convention, Hotel Del Monte, Del Monte, Calif., Jan. 31-Feb. 1, 1930.

National Electric Light Association—Fifty-third convention, San Francisco, June 16-20, 1930.

Pacific Coast Electrical Association—Joint convention with National Electric Light Association, San Francisco, June 16-20, 1930.

Commercial Section meeting, Hotel Fairmont, San Francisco, Jan. 9-10, 1930.

Engineering Section meeting, Los Angeles, Jan. 16-17, 1930 (tentative).

San Francisco Engineers' Club Elects Officers—The following officers were elected to serve for the ensuing year at a recent annual election of the Engineers' Club of San Francisco: President—C. E. Fleager, vice-president, The Pacific Telephone and Telegraph Company; first vice-president—E. J. Schneider, contracting manager, bridge and structural department, U. S. Steel Products Company; second vice-president—Stanley Sharp, Standard Oil Company of California; secretary—E. N. Britton, King-Knight Company; treasurer—A. D. Oliver, vice-president, Wells Fargo Bank & Union Trust Company. The directors elected for three-year terms are Charles M. Gunn, president, Gunn, Carle & Company, and H. D. Dewell, consulting civil engineer; and for a two-year term, O. W. Peterson, engineer of general construction, Pacific Gas and Electric Company.

Contractors, Dealers and Inspectors

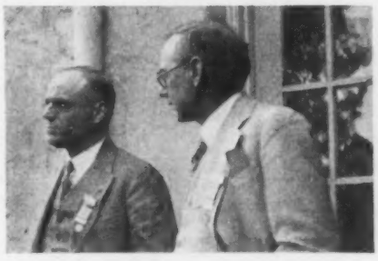
Southern California Inspectors Meet

Following closely upon the convention of the Southwest Section of the International Association of Electrical Inspectors at San Francisco, the members of that organization in southern California met in Los Angeles to set up a chapter of the Southwest Section. The meeting was held on Oct. 18 for all inspectors in that area. It was called at the instance of James M. Evans, engineer for the Fire Underwriters of the Pacific, Los Angeles.

A. E. Johnstone, president of the Southwest Section, gave an outline of the year's work proposed by the section. R. H. Manahan, chief electrical inspector, Los Angeles, gave a resume of the San Francisco convention. Chapter organization was set up and the remainder of the meeting was devoted to discussion of national standardization and code matters.

Similar meetings are proposed occasionally to discuss mutual problems and interpretations of codes and ordinances in the southern California area.

Serious Business



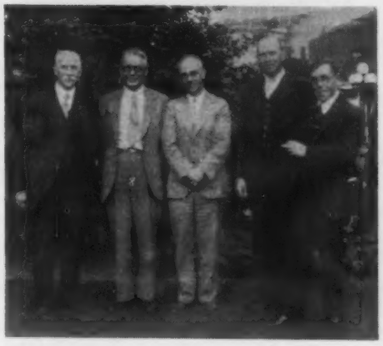
Clyde Chamblin, *left*, past president of the A.E.I., discusses with H. C. Reid, of San Francisco, an executive committeeman, some of the serious aspects of the contracting business, and how!

The Exchange Building in Seattle, recently erected, was wired by **Frank Steel, of Steel & Phelps,** electrical contractors of Seattle. It was equipped completely for stock exchange electrical equipment of various kinds.

C. B. Campbell Company, electrical contractors of Seattle, recently moved from 518 Seneca to 710 Eighth Ave., where larger accommodations are available. The basement is all given over to a shop. Small office space upstairs with an estimating room complete the new arrangement.

A Class in Theory and Practice and code rules has been organized by a committee headed by Harold Gerber of the Department of Electricity, San Francisco, and held under the auspices of the local No. 6 Chapter of the I.B.E.W. The class has been opened to wiremen and helpers and meets every Thursday evening. Classes were begun April 11. The place of meeting is the Horace Mann School at Twenty-third and Valencia Sts., San Francisco. Over 200 applications to enter this school were made in a questionnaire sent out prior to the starting of the classes.

Five Inspector Presidents



Left to right, J. C. Forsyth, New York City, president of the I.A.E.I.; H. A. Patton, Seattle, third president of the Northwest Section; L. W. Going, Portland, first president; H. J. Jenkins, Bellingham, second president; and C. H. Fletcher, Vancouver, B. C., newly elected president, Northwest Section

First of B-J Chain Stores Opens in Spokane

The first of a chain of B-J electric merchandising and repair shops was opened in Spokane Sept. 10 in the new Paulsen-Medical Dental Building by the B. J. Electric Stores, which are affiliated with the Brown-Johnston Electric Company.

With plate glass windows on three sides, the new shop is compact and is so situated that it has entrance from the street and from the building lobby. Price tags are attached to all merchandise and repair work is done while the customer waits, where practicable.

Ordinances to Prohibit equipment which causes radio interference during the evening hours have recently been passed in a number of communities, among them the Cities of Los Angeles, San Diego, Red Bluff and Sacramento, Calif.; Vancouver, B. C.; Olympia, Wash.; Portland, Ore., and others. Although the text of most of these ordinances is similar in form, each has its own special provisions. Practically all make exceptions for the legitimate use of high-frequency machines for medical treatment in emergency cases.

New Red Seal Man

John A. Baker, formerly electrical maintenance engineer for the Ford Motor Company, Denver, has been appointed by the executive committee of the Electrical League of Colorado as field representative to succeed the late Charles W. Munchow. From 1921 to 1923 Mr. Baker was a member of the Western Electric Company's sales force, later was engaged in the electrical contracting business, and during 1928 was merchandise manager of the Commonwealth Utilities Company.

A floodlighting system has been completed in Christ Church, Victoria, B. C., cathedral. It was declared most satisfactory by cathedral authorities. The installation was made by **H. J. Longdon** of Esquimault, B. C.

H. C. Moss Construction Company, Seattle, has received contract for installing a street lighting system of 72 Westinghouse granite poles and removal of existing iron poles at Pasco. Wash.

C. O. Woodworth has succeeded **E. R. Meyer** as supervisor of gas and electricity for the City of Denver, Colo. Mr. Meyer resigned recently to become instructor in the manual training department at the West Denver High School.

The A. J. Beachner Electrical Company is the name of the new store opened by Mr. Beachner after the dissolution of the partnership of **Beachner & Poucher,** electrical contractors at Denver, Colo. The new store is at 724 East Colfax Ave.

D. H. Wessel, formerly estimator for the **Newbery-Pearce Electric Company,** of San Francisco, has been named managed of **The "Wired-Heat" Shop** at Oakland, Calif. This company is specializing in the installation of electric heaters, and particularly of the Wesix products.

Lee Baltzelle, for many years estimator and superintendent for the **J. J. Farley Electric Company,** at Fullerton, Calif., and prominent in estimating activities of the California Electragists, Southern Chapter, recently resigned to accept a position with the Fox Movietone Studios, at Hollywood.

Los Angeles Estimators Frolic at Beach Party

Starting the three-legged race at the annual beach party of the Los Angeles Estimators' Section. This annual affair this year was bigger and better than any previous party

P. A. ("Pete") Shrader, amiable and efficient recording secretary of the section, keeping tab on the sports events

[The only event that could not be tabulated was known as "the main event" in which there were so many winners that no one could tell anything for the smoke.]

J. R. ("Bob") Wilson, impresario, ringmaster and president of the Estimators' Section, wearing the official "crown of office" at the beach affair

Committee appointments of the Association of Electragists International under its new administration have placed two Western men on the executive committee of the national association. **Clyde L. Chamblin**, of San Francisco, and past president of the A.E.I., was named executive committeeman for the Pacific Coast for a two-year period. His work will also have to do with his chairmanship of the standardization committee. **George R. Randall**, prominent electrical contractor of Salt Lake City, was elected to the executive committee for the Mountain territory for a period of one year. He succeeds **E. C. Headrick**, who has served in that capacity for several years. Mr. Randall's special committee assignment will be on the credit and accounting committee.

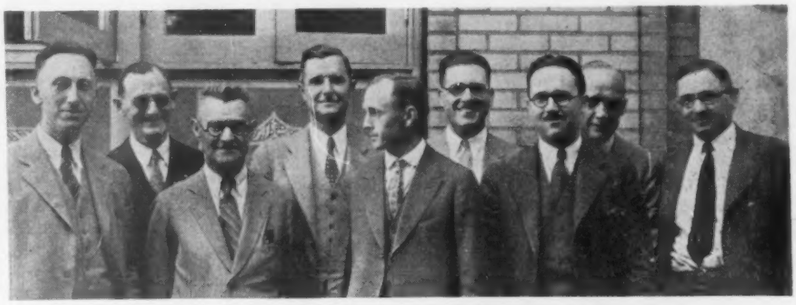
Long Beach Electragists, as a branch of the Southern Chapter, California Electragists, recently were organized with **Lou Wetzel** as president and **R. W. ("Bob") Abright** as secretary-treasurer. Mr. Abright was former city electrical inspector and was one of the first presidents of the California Electrical Inspectors' Association. The membership of the Long Beach group is about fifteen and meetings are held every Wednesday night. A definite program of constructive educational and civic activities has been planned. **Fred White**, field secretary of the Southern Chapter, is conducting the educational work.

The North Orange County branch of the California Electragists, Southern Chapter, recently was organized to comprise the Anaheim and Fullerton districts. **Frank Steuckle**, of Anaheim, was named president and **Charles Waits**, of Fullerton, secretary-treasurer. This group also meets weekly for constructive educational and organization activity.

Award of the James H. McGraw Medal and purse to contractor-dealers for 1929 was made at the A.E.I. convention at Swampscott, Mass., in September to **John Kuhlemeyer**, prominent organizer and electrical contractor in Chicago. Mr. Kuhlemeyer's achievement in the development of information and methods of teaching cost accounting and his constructive work in the organization and education of contracting groups in many Eastern communities was considered by the judges to have made the most constructive contribution to the advancement of the contractor-dealer branch of the electrical industry.

C. H. Messner, electrical contractor-dealer of La Jolla, Calif., recently completed the wiring of the new clinic building at the La Jolla Hospital, a new wing added to the hospital this last year. Mr. Messner also wired most of the main buildings of the hospital.

Advance Guard at Portland



When Larry Davis, manager of the Association of Electragists International, arrived in Portland he was greeted by these Electragists in advance of the meeting held for him there. *Left to right* are W. Grasle, estimator for E. L. Knight Electric Company; J. R. Tomlinson, field secretary, Oregon Electragists; E. L. Knight, contractor-dealer, Portland; L. W. Davis; A. R. Johnson, superintendent of construction, M. J. Walsh Electric Company, Portland; Harold Parrott, manager, Morrison Electric, Portland; E. L. Owens, credit man, Stubbs Electric Company, Portland; S. W. Peterson, manager, Stubbs Electric Company; and Harry Sroufe, Jaggar-Sroufe Company, Portland.

Personals

Heads Public Service Co.'s Electric Department

A. H. HEITZLER, for the past five years division manager at Lorain, Ohio, for the Ohio Public Service Company, assumed new duties Nov. 1 as superintendent of the electric department of the Public Service Company of Colorado, following his transfer to Denver.

Harry H. Kerr, whose former position Mr. Heitzler now occupies, has been promoted to the superintendency

A. H. HEITZLER

of electric operation for the Toledo Edison Company, with headquarters at Toledo, Ohio. Both men were student engineers with the Public Service Company fourteen years ago, immediately after graduation from college. Mr. Heitzler, a University of Texas man, then elected Ohio as his most promising field, while Mr. Kerr, from the University of Colorado, chose at that time to remain in Denver.

Monuments to Mr. Kerr's work in Colorado are the central Lacombe plant in Denver, which controls routing of all the electric current of the Public Service Company of Colorado, and the Valmont steam generating plant near Boulder, Colo.

Mr. Heitzler's career as an engineer includes service with utilities in San Angelo and Amarillo, Texas, with the Toledo Railway & Light Company, the Acme Power Company, and the Mansfield Electric Company. He served as a lieutenant of engineers in the World War; was associated with the Alliance Gas & Power Company upon his return from abroad; became general superintendent of the Massilon Division in 1921; was transferred to the position of general superintendent of Lorain and Elyria divisions in 1922; and in 1923 assumed his duties as manager of the Lorain district.

New President of Seattle Electric Club

GROVER C. BURKE, who is associated with R. T. Evans in the City Electric & Fixture Company, Seattle, is the newly elected president of the Elec-

GROVER C. BURKE

tric Club of Seattle, an organization with which he has been prominently identified since its inception.

Mr. Burke has been engaged in the electrical contractor-dealer business for about ten years. Prior to that time he was in the real estate business, associated with John Davis & Company, one of the largest realty firms in the Pacific Northwest. Leaving the real estate business, Mr. Burke established a small electrical shop in the University district of Seattle, later joining forces with Mr. Evans, a practical electrician.

Mr. Burke is also president of the Overlake Golf and Country Club and by the membership of that club is known as "Hole-in-One" Burke, having collected his "dodo" a few months ago before, it is stated, several reputable witnesses.

J. A. Clay and R. M. Morris Head Utility Associations

J. A. CLAY, president-elect of the Rocky Mountain Division, N.E.L.A., and Ray M. Morris, president-elect of the Colorado Utilities Association, were formerly "bedfellows" in the utilities field at Durango, Colo., for half a dozen years and, appropriety enough, were designated for leadership in their respective organizations simultaneously during the recent joint session at Glenwood Springs, Colo.

Mr. Clay, a graduate of the University of California, formed his first utilities contact in 1900 with the old Independent Light & Power Company, San Francisco—now a part of the Pacific Gas and Electric Company—first in construction work and later in the operating department. He next became associated with the Tacoma Railway & Power Company for a year, and followed this experience with construction work for the General Electric Company and The Washington Water Power Company. He also served as mechanical-electrical engineer for the Hecla Mining Company in the Coeur d'Alene mining district before going to Colorado in 1905 to join the Electric Bond & Share Company. Later he became general superintendent of the Animas Power & Water Company—now the Silverton district of the Western Colorado Power Company—and was appointed receiver in 1907 when mining depression caused disaster to the firm. Reorganization of the company in 1909 as the San Juan Water & Power Company placed him in the general manager's office. In 1913 the Western Colorado Power Company was organized, acquiring the San Juan company, the Durango property, Telluride Power Company and Ouray, Montrose and Delta district properties. Mr. Clay has been general manager of the Western

J. A. CLAY

Colorado Power Company, with headquarters at Durango, since its inception in 1913.

Mr. Morris has been allied with development of the telephone business during his entire commercial career, beginning in 1903 with a small, independent concern in eastern Kansas. In

RAY M. MORRIS

1905 he moved to Colorado and worked in the plant department of the Colorado Telephone Company, which pioneered wire communication in that state. His affiliation continued when the company

reorganized in 1911 as the Mountain States Telephone and Telegraph Company, absorbing several smaller companies. It was at this period—1911 to 1917—that Mr. Morris and Mr. Clay were so closely associated at Durango, Colo., although in different lines of activity.

In 1917 Mr. Morris went to Montana as division commercial superintendent of the Mountain States company, and in 1920 he was recalled to Denver and was appointed general commercial engineer. In 1923 he was promoted to the general commercial managership, and the year 1929 saw his advancement to assistant vice-president in charge of all commercial phases of the telephone company's business.

George B. Sanford, for the past three years secretary and assistant treasurer of the Grays Harbor Railway & Light Company, Aberdeen, Wash., sailed Nov. 16 for Rio de Janeiro, where he will be associated with the Emprezas Electricas Brazileiras, an American and foreign power company property. Mr. Sanford formerly was associated with the Denver Gas & Electric Company and the Great Western Power Company of California. For nine years he was in charge of the Great Western company's activities in Sacramento, Calif., and later served there as division manager. **R. G. Barnett,** formerly in charge of the publicity department of the Coast Counties Gas & Electric Company, Santa Cruz, Calif., also has joined the organization of the Emprezas Electricas Brazileiras, Rio de Janeiro.

B. P. Baily, formerly district manager at Yakima, Wash., for the Pacific Power & Light Company, has been transferred to the operating department of the company at Portland. Mr. Baily is succeeded in Yakima by **L. R. Sheeley,** formerly district manager at Bend, Ore., and **W. A. Lackaff,** formerly purchasing agent, has succeeded Mr. Sheeley in Bend as district manager.

James J. Ferrari, superintendent of the gas department of the Puget Sound Power & Light Company in Bellingham, Wash., has resigned to become superintendent of gas and water for the Sierra Pacific Power Company in Reno, Nev. **C. P. Johnson,** Haverhill, Mass., who has been associated since 1919 with Stone & Webster, Inc., which controls the two companies mentioned, has been appointed to succeed Mr. Ferrari.

R. K. Tiffany has resigned as Washington State Supervisor of Hydraulics, with headquarters in Olympia, effective immediately, and **Charles R. Bartholet,** who has been assisting supervisor since organization of the office under the new water code of 1917, has been named supervisor. Mr. Tiffany will be associated with Lars Langloe, formerly affiliated with the hydraulics office, in irrigation, commercial and other branches of hydraulic work. Mr. Tiffany was recently appointed by President Hoover as a member of the federal commission on reclamation and development of public lands.

F. S. Burroughs, president, Public Utility Holding Corporation, the recent purchaser of the Portland Electric Power Company, visited the property in Portland on Nov. 1 with **C. M. Clark,** of Philadelphia, chairman of the executive committee of the holding company. It was announced at that time that no changes in management or policy were contemplated.

Walter T. Wells, for a number of years Pacific Coast representative for the Union Metal Manufacturing Company with headquarters in Los Angeles, and prior to that associated with the General Electric Company, Denver, in its street lighting department, has been made president and manager of the Pacific Oil Tool Company, Ltd., Los Angeles.

Morris F. Wales, formerly commercial manager of the Coast Counties Gas & Electric Company, Santa Cruz, Calif., has joined the staff of the Los Angeles Gas and Electric Corporation as chief collector.

Obituary

Death of John W. Lieb Robs Industry of Veteran

JOHN W. LIEB, senior vice-president of the New York Edison Company, and one of the pioneers of the electrical industry, died in New Rochelle, N. Y., Nov. 1 at the age of 69.

It was Mr. Lieb who supervised the installation of the electrical equipment in the pioneer Pearl St. station built in New York City in 1882, and with the inauguration of regular electric service he became the first electrician of the Edison Electric Illuminating Company of New York. Later, after supervising the erection and operation of a station for the Italian Edison Company in Milan, Italy, he returned to New York to become assistant to the vice-president of the Edison Electric Illuminating Company, and subsequently became vice-president and general manager. On the organization of the New York Edison Company, Mr. Lieb was made associate general manager and eventually vice-president and general manager. He relinquished the active duties of management only last year to become a senior vice-president.

Mr. Lieb belonged to many of the organizations in the electrical and allied fields. He was a past president of the American Institute of Electrical Engineers, National Electric Light Association, the Association of Edison Illuminating Companies, the Edison Pioneers, and the New York Electrical Society. In 1923 he was awarded the Edison Medal by the American Institute of Electrical Engineers for his achievement in the development and operation of electric central stations for illumination and power.

J. A. Vandegrift of National Lamp Works Passes

J. A. VANDEGRIFT, formerly general manager of the Pacific Coast sales activities for the National Lamp Works of the General Electric Company, with headquarters in Oakland, Calif., died in that city Nov. 15, at the age of 69.

During the early part of his career, Mr. Vandegrift was a carbon lamp manufacturer and this took him to foreign countries where he sold and installed lighting plants and lamps. Finally, he returned to the United States and built and operated a carbon lamp factory in Denver, Colo. About 1903 or 1904 he came to the Pacific Coast to take charge of the Oakland warehouse of the National Electric Lamp Association, which later became the National Lamp Works of the General Electric Company. He built and operated the first unit of the lamp factory now located at 1648 Sixteenth St., Oakland. About 1910 he took charge of sales in addition to factory responsibilities and continued this joint operation until 1914 when he placed the factory operations in other hands and spent all of his time on sales work. In 1924 he retired as general manager of Pacific Coast sales activities.

Mr. Vandegrift's intense interest in the development of the electrical industry brought him in close contact with all branches of it. He was an active member of the San Francisco Electrical Development League and was one of the organizers of the Electric Club of Oakland.

David Reed, president of the International Association of Municipal Electricians, died at his home in Denver, Colo., Oct. 25. Mr. Reed had been a member of the Denver fire department since 1892, and since 1899 he had been in charge of the fire alarm systems in that city, a work for which he was known throughout the United States. He became head of the International Electricians in 1928 and it is due to his efforts that the 1930 convention is to be held in Denver.

Walter Wells, veteran electrical engineer of the Province of British Columbia, died recently on Bowen Island, B. C. Mr. Wells has been well known in the electrical industry of the Province for the past 22 years.

Manufacturer & Distributor

Thumbull Electric Co. Buys A. G. Manufacturing Co.

Fulfilling a long felt need for Pacific Coast manufacturing facilities, the Trumbull Electric Manufacturing Company, Plainville, Conn., has purchased the controlling interest in the A. G. Manufacturing Company with plants in Seattle and Los Angeles, manufacturers of safety and knife switches and switch and panelboards. As a result of the purchase a new company, the A. G. Electric Manufacturing Company, has been organized on the Pacific Coast for the purpose of continuing the manufacturing activities of the old concern and representing the complete Trumbull line in this territory.

Officers of the new company are: President and treasurer—A. E. Griswold; vice-presidents—Gov. J. H. Trumbull and F. T. Wheeler; secretary—W. E. Froude; assistant secretary—S. S. Gwillim; assistant treasurer—Henry Trumbull. A. S. Moody, Northwest division manager of the General Electric Company, is a member of the board of trustees.

H. F. Yost, formerly Pacific Coast manager of the Trumbull company, will act as Pacific Coast sales manager of the new company. Charles Callahan will be district sales manager in the Pacific Northwest, and Carroll Hepler manager of the Seattle plant. H. B. Griswold will serve as district manager in Los Angeles. The present Trumbull sales force on the Pacific Coast will be consolidated with the A. G. sales force.

Complete stocks of Trumbull lines will now be carried in San Francisco, Los Angeles and Seattle.

The deal was consummated by S. S. Gwillim, general manager of the Trumbull company, who made a special trip to the Pacific Coast for the purpose.

To Make Survey of Electric Heating and Refrigeration

A national survey of the distribution of electric refrigerators and electrical heating appliances will be undertaken by the electrical division of the U. S. Department of Commerce as soon as it completes its distribution study of radio sets. The final analysis of the radio study is in process of completion and it is expected that the census of heating appliances and refrigerators will be well under way by Jan. 1.

The last section of the radio study will show the number of sets sold by the various types of stores according to trading areas. This information is expected to be of great benefit to the dealers and manufacturers in settling their sales quotas and in preparing their advertising campaigns. Nothing as comprehensive as this study has ever been made before on radio sales, according to officials of the Commerce Department.

It is expected, similarly, that the census of distribution of heating appliances and refrigerators will indicate new avenues of trade to the electrical industry. Potential markets in the various trading areas, hertofore only guessed at, will be shown for the first time in actual figures, it is stated. The sale of these appliances will also be broken down according to the various types of outlets.

Line Material Specialist Added to Distributor's Staff—Fred L. Johnson, formerly Miami manager for the Florida Electric Supply Company, has joined the Associated Wholesale Electric Company, Los Angeles, in the capacity of specialist on line material products and other transmission department equipment.

Northwest Distributor for Thermador Appointed—R. E. Ruble, 3329 White-Henry Stuart Building, Seattle, has been appointed distributor in Washington and Oregon for the Thermador, an electric room heater manufactured by the **Hoffman Specialty Company**, Waterbury, Conn.

The American Metal Moulding Company, Irvington, N. J., has appointed Alexander W. Bromberg, 846 South Wall St., Los Angeles, to have charge of the company's sales of conduit in that city.

New Buildings in Los Angeles and Long Beach for Illinois Electric Company

PLANS have been completed for a new office and warehouse for the Illinois Electric Company, Division of the Westinghouse Electric Supply Company, to be built at Second and Garey Sts., Los Angeles. The new structure will consist of a two-story office and display building with a one-story warehouse. The entire building comprises 50,000 sq.ft. of floor space.

Designed for convenient and economical operation, the new building will include the following features: A 20 x 120-ft. space in front of the offices for parking customers' cars, a spur track serving the warehouse, a large loading bay for trucks and a ramp from the street up to the warehouse floor for customers' trucks for loading conduit at the conduit racks.

Offices and display rooms will be on the first floor of the two-story corner structure. The remainder of the structure will be used for storage and warehouse purposes.

The Illinois Electric Company recently completed and moved into a new branch office in Long Beach, Calif., at 1601 West Anaheim Blvd. This new building comprises 5,000 sq.ft. of floor area. It was constructed to facilitate service to the rapidly growing industrial area adjacent to Long Beach.

The moving of the Illinois Electric Company offices to Second and Garey Sts. definitely establishes this section of Los Angeles as the electrical wholesale center. Other wholesale organizations in the immediate vicinity include Listenwalter & Gough, the General Electric Supply Corporation and the Western Light & Fixture Company.

The Illinois Electric Company's new branch office building in Long Beach, Calif.

Westinghouse Broadcasts Salutes to Industry

A good will series of half-hour radio programs, each dedicated to a particular industry, is being sponsored by the Westinghouse Electric & Manufacturing Company and is on the air over a National Broadcasting Company coast-to-coast network every Wednesday at 4:30 p.m. (Pacific standard time).

The programs, known as Westinghouse Salutes to Industry, are in the main musical presentations with one or two dramatic episodes inspired by the history, romance, achievements and progress of the industry receiving the "salute" introduced in each production. Requiring a personnel of about 125 musicians and actors, the programs are designed and built solely as entertainment, and no solicitation is made to the audience to buy Westinghouse products. Instead of the customary announcer, the voice of Pedro de Cordoba links together the various parts of the program.

The broadcast was inaugurated on Nov. 6 with a "salute" to the iron and steel industry. Other industries scheduled for similar tributes up to the first of the year are as follows:

Aviation	Nov. 13
The paper industry	Nov. 20
The food industry	Nov. 27
The textile industries	Dec. 4
An electrical Christmas	Dec. 11
Pumping and irrigation	Dec. 18
Electricity in the home	Dec. 25

Open Los Angeles Branch Office and Stockroom—A branch office and stockroom have been opened at 703 Terminal Sales Building, Los Angeles, by **The Bristol Company**, manufacturer of recording instruments, Waterbury, Conn. The company maintains a branch office at 727 Rialto Building, San Francisco, but heretofore only a small emergency stock has been carried in Los Angeles. The new branch office serves as headquarters for S. W. Case, district manager, F. W. Borchers, sales and service engineer, and C. M. Willis, service engineer.

A. E. Buttner, general manager, **Electrical Specialty Company, Inc.**, San Francisco, recently returned from his annual trip to the East to visit the factories of the manufacturers whom he represents on the Pacific Coast. While in New York he attended the First National Electrical Exposition, held Oct. 7-12.

Appoints Arizona Representative—**The Kuhlman Electric Company**, Bay City, Mich., manufacturer of power, distribution and street lighting transformers, has appointed Frank C. Fassett, 15 East Jackson St., Phoenix, as its representative in Arizona.

H. M. Thomas has discontinued his affiliation with the **Electric Materials Company, Inc.**, San Francisco, and in future will devote his entire attention to the business of **H. M. Thomas Company**, San Francisco, of which he is the head.

National Mazda Lamps Now General Electric Mazda

National Mazda lamps, a product of the General Electric Company, will in future be known as General Electric Mazda lamps, according to a recent announcement of the National Lamp Works of the General Electric Company, Cleveland, Ohio. General Electric Mazda lamps will be sold by the National Lamp Works with the same selling organization and through the same channels that distributed National Mazda lamps.

J. E. Kewley, general sales manager of the National Lamp Works, explains that with the new name distributors will be given the benefit of all General Electric advertising and good will.

The Edison Lamp Works of the General Electric Company will continue to sell lamps under the name of Edison Mazda lamps.

Distributor Opens New San Francisco Office—J. G. Pomeroy Company, Pacific Coast manufacturers' representative, has opened a new office and warehouse in San Francisco at 355 Ninth St. Harold Pomeroy, president of the J. G. Pomeroy Company, has resigned as special representative of the General Cable Corporation in the Los Angeles territory and will in future devote his entire time to the interests of the Pomeroy company.

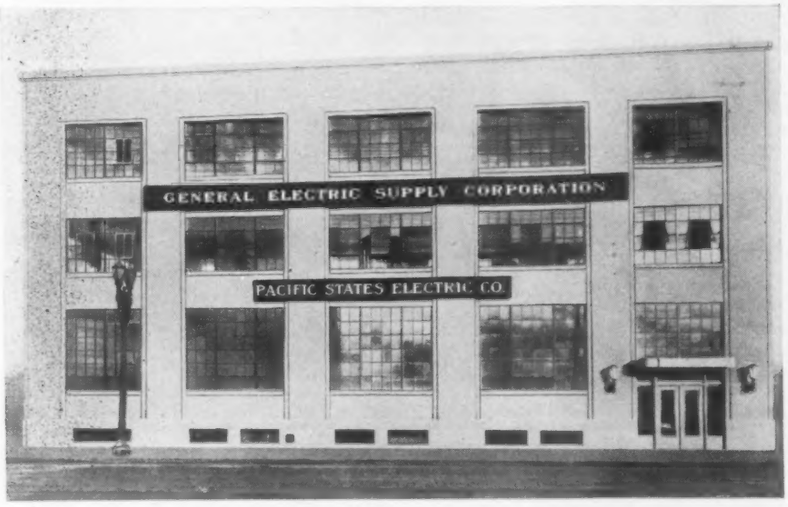
Electrical Products Corporation Moves to New Building—A new two-story administration building is now being occupied by the Electrical Products Corporation, of Oakland, Calif. The new structure is the fourth major addition that has been made to the local plant since 1925. The plant now contains 52,000 sq.ft. of floor space, employs 150 persons, and has a yearly payroll of $35,000, according to William E. Joost, general manager.

Two New Lines for Seattle Distributor—**The Portalite Company**, Cambridge, Mass., and the **Adjustable Electric Lamp Company**, New York, have recently appointed Frank U. Bliss, 4124 Tenth Ave., Seattle, sales representative for their products in the Northwest territory.

Pass & Seymour, Inc., Syracuse, N. Y., are being represented in southern California by **H. B. Squires**, manufacturers' representative of Los Angeles, and not by the H. B. Squires Company, as erroneously announced in a recent issue of "Electrical West."

Gem Appliances, Inc., 280 Madison Ave., New York, manufacturer of the Gem kitchen mechanic, has appointed H. S. Wintermute, 8022 Meridian St., Seattle, as its distributor in the Northwest.

Seattle Headquarters of G. E. Supply Corp.



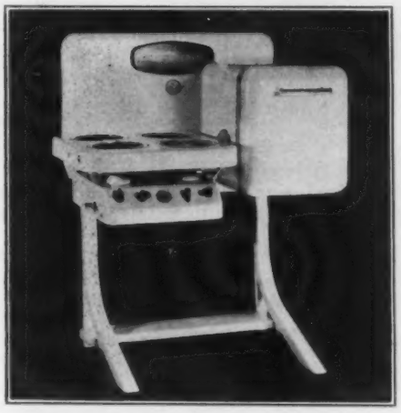
NEW home of the Seattle branch of the General Electric Supply Corporation, formerly Pacific States Electric Company, at 1212 First Ave. South. The building occupies more than 60,000 sq.ft. of floor space and houses offices, warehouse, display and service rooms. Adjacent parking space is provided for patrons. The building was formally opened on Nov. 4.

New Equipment

The Electrochef

To meet the demand for a compact, high-speed range of full capacity that could be sold at a popular price, **Electro-Master, Inc.,** Detroit, Mich., has announced the development of the Electrochef, an electric cooking machine for household use.

The Electrochef departs in style and principle from electric ranges previously available. An ingenious arrangement eliminates all exterior nuts and bolts, does away with protruding front legs, and gives a modern touch to the range. The oven is air insulated and



comes to cooking temperature in less than five minutes after the switch is turned. It is automatically controlled by a thermostat and is equipped with a flashing signal which comes on and off with the heat about once a minute. The interior of the oven is finished in burnished chrome plate.

The use of both reflected and convected heat, and the decrease in the mass of the cooking table element are, according to the manufacturer's statement, responsible for remarkable speed and efficiency in these units. These heaters are identical, 1,400 watts, and are cone shaped with a reflector of heavy chrome plate on thick rust-resisting steel to direct the heat evenly to the utensil. Two convenience outlets are placed just below and at either side of the cooking table. Installation of the range is made easy by means of a special wall outlet with which all models are equipped.

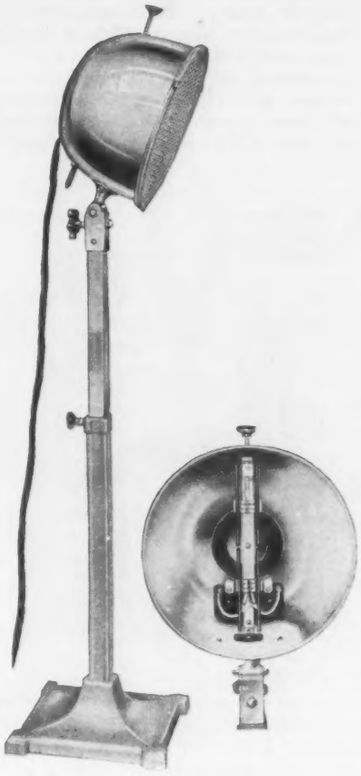
A sample model of the Electrochef is now being sold through power companies to determine public reaction and acceptance. The present price of this model to the companies is $85 f.o.b. Detroit. It is expected, however, that the price for later models will be in the neighborhood of $60.—Electrical West, Dec. 1, 1929.

Household Switches

Two new household switches have been announced by the **Eagle Electric Manufacturing Company,** 59 Hall St., Brooklyn, N. Y. A feed-through switch of sturdily constructed two-piece brown composition with positive "on" and "off" switch is Catalog No. 155. A multiple kitchen unit switch of the same color and construction, Catalog No. 160, offers three outlets always "on" though the light switch is "off." List price of the feed-through switch is 40 cents, and of the kitchen unit 60 cents.—Electrical West, Dec. 1, 1929.

Violet-ray and Infra-red Health Lamp

A new health lamp that gives a combination of ultra-violet rays and infra-red rays is being placed on the market by the **Hurley Machine Company,** Chicago. This new lamp is a combination twin carbon arc and infra-red generator and will be known as the Thor double-benefit health lamp. The infra-red rays can be used separately and independently of the ultra violet rays. The arc is broken automatically after the lamp burns several minutes. The lamp can be tilted to any desired position and the height can be regulated from 35 to 60 in.—Electrical West, Dec. 1, 1929.



Ferrule-Type Fuse

Renewal is quick and easy with a new Union ferrule-type renewable fuse recently announced by the **Jefferson Electric Company,** 1500 South Laflin St., Chicago. The fuse consists of three simple parts—the casing and two caps—in addition to a link. The casing

is made of grey horn fiber, to which the brass ferrules are secured.

These ferrules are threaded and are entirely covered when the caps are screwed into place. To renew, it is only necessary to unscrew the caps, pull out the burned links, clean out the casing, if necessary, through the openings at both ends, insert new link, and screw on the caps.

The caps are provided with a method of positive venting which relieves the pressure generated by the operation of the fuse on a heavy overload or short circuit and insures maximum use of the fuse.

The link is bent at one end, which automatically adjusts the length to the casing, and assures correct fit without experimentation. — Electrical West, Dec. 1, 1929.

Reflector Heater

Mogul No. 81 is a new model 1,000-watt reflector heater that has just been added to its line of heating appliances by the **Majestic Electric Appliance Company,** 590 Folsom St., San Francisco. The heater is finished in antique lacquer bronze with chormium plated reflector, and is furnished with an 8-ft. cord and plug. Retail price, $12.50.—Electrical West, Dec. 1, 1929.

Spray Painting Outfit

An all-purpose, utility spray painting and finishing outfit, known as the Binks Hurley unit, designed for general utility work such as touching up, refinishing, repainting and lacquering prac-

tically any product, and also adapted for the spraying of insecticides and disinfectants, is announced by the **Binks Manufacturing Company**, 3114 Carroll Ave., Chicago. It is a complete unit equipped with a full size quart all-metal container and a pressure cup spray gun supplying an atomized flat spray 4 in. in width. The air compressor unit has a capacity of 2.16 cu.ft. of air per minute. It is belt driven and connected to a ¼-hp. motor.

The unit is sturdily constructed and ready for use by the inexperienced or experienced operator upon delivery. Ten feet of rubber covered cord, and 10 ft. of braided rubber air hose are attached to the outfit.—Electrical West, Dec. 1, 1929.

Switch and Receptacle

A new product of **The Bryant Electric Company**, Bridgeport, Conn., is its No. 2989 switch and receptacle combination. This consists of a "Spartan" T-slot flush receptacle with the finding

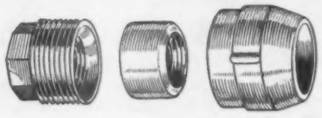
rib in a single gang unit with a double pole tumbler switch, vertically operated. The device has a Bakelite cup, the plate is made of Temples and the boss is integral with the plate.

The receptacle has the standard rating of 15 amp. 125 volts, and 10 amp. 250 volts, while the switch has the full 10-amp. 250-volt rating of a double-pole tumbler switch. The manufacturer calls attention to the practical sturdy switch mechanism and the strong steel commutator carrier. Samples of this device have tested on endurance 107,800 cycles average before failure.—Electrical West, Dec. 1, 1929.

Water-tight Coupling

A water-tight conduit coupling known as the "Universal" is being manufactured by the **Steel City Electric Company**, Pittsburgh, Pa. The coupling is made of malleable iron and galvanized, and when used on conduit laid in concrete the ingress of thin grout into the conduit is impossible, according to the manufacturer.

"Universal" couplings have bushing and sleeve members which are left-hand threaded so that the act of screwing up the sleeve has a tendency to screw on the inside collar instead of backing it off the threads. With these couplings pipes as much as 15 deg. out of alignment may easily be joined together, running threads are unnecessary and a conduit may be opened at any point

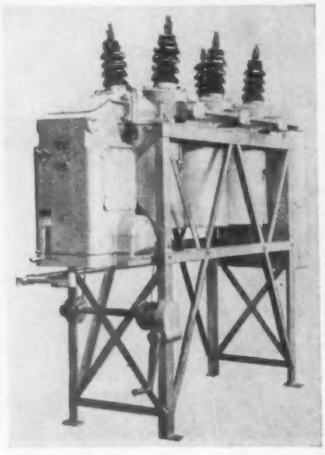


desired. The water-tight construction of the couplings makes them especially suitable also for marine installation.—Electrical West, Dec. 1, 1929.

Oil Circuit Breakers

Two more sizes have been added by the **Pacific Electric Manufacturing Corporation**, 5815 Third St., San Francisco, to its JC type oil circuit breakers. These breakers now are available in voltages from 11,000 to 37,000.

Features of this type of oil circuit breaker are: One cast top member for all three phases with individual tanks per phase; all operating parts are fas-



tened to the one-piece top member and assembled at the factory and shipped without disturbing the factory adjustment; the breakers are of the rotary break type, a principle that was used on the first successful 60-kv. oil circuit breaker over 25 years ago.

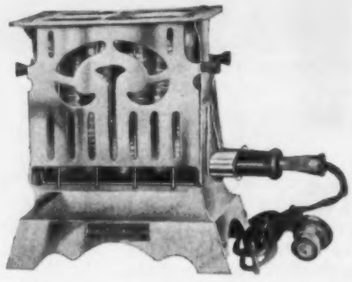
These breakers may be motor or solenoid operated. Either type of control can be mounted on the end or side of the breaker without the use of additional parts, and the two styles of control are interchangeable as far as mountings are concerned. They are all of the type that compress the operating springs while the breaker is at rest. The amount of energy needed for this operation is very slight—any good 24-volt storage battery will furnish the required auxiliary current. This feature is very valuable for the installation of breakers in remote regions where a d.c. bus for control circuits is not available.

The JC-17 breaker is rated to interrupt 100,000 kva. at 15 kv. Types JC-22 (illustrated) and JC-26 have a rating of 125,000 kva. at 25 kv. and 37 kv. respectively.—Electrical West, Dec. 1, 1929.

Toaster and Waffle Iron

Two new table appliances of the **Rock Island Manufacturing Company**, Rock Island, Ill., are the Tee-Ten toaster and the Rimco Aristocrat waffle iron.

The toaster is "over-sized" and toasts two slices of home-made or baker's 1½-lb.-loaf bread. Retail price, $3.75.



Slim, graceful lines give the Rimco waffle iron a daintiness in appearance, although it is sturdily constructed of

solid brass. The iron makes larger than average waffles and cooks them rapidly. It has a Chromalox heating element. Retail price, $9.85.—Electrical West, Dec. 1, 1929.

Hotpoint Hotplates

New Hotpoint hotplates of the **Edison Electric Appliance Company, Inc.**, 5600 W. Taylor St., Chicago, may be obtained with either a single unit or two units. A three-heat single-unit hot-

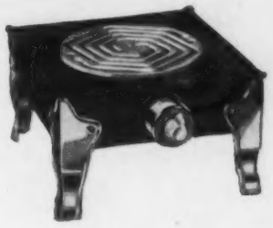


plate is of pressed steel construction in black Japan finish with polished nickel legs, with maximum wattage of 1,100 watts. List price, $5.50.

A two-unit Hotpoint hotplate in black Japan finish is equipped with one 1,100-watt unit and one 550-watt unit, with reversible three-heat switch. List price, $8.80. Another two-unit model has two open coil units each 550 watts, and retails for $6.90.

In white vitreous enamel finish with black trim, a three-heat model has two 1,100-watt units, and retails for $11.90. All have voltages rated at 110 and 120. —Electrical West, Dec. 1, 1929.

Laundry Stove

The Standard Electric Stove Company, Toledo, Ohio, has placed in the market an electric laundry stove, known as Model No. 40-L. The stove is 22 in. wide, 26 in. high, and 12 in. from front to back. It has two 8-in. open or enclosed burners, each with a 3-heat switch. It is a strong, durable stove finished in either black enamel or white porcelain enamel. List price, $26.25.—Electrical West, Dec. 1, 1929.

Recent Publications

Electric Water Heaters—"Modern Electric Hot Water Service" is the title of an illustrated booklet published recently by the **Everhot Electric and Manufacturing Company**, 116 Llewellyn St., Los Angeles. The information given in the booklet is intended for salesmen, central station employees, and everyone interested in electric water heating.

Controlling and Distributing Apparatus—Bull Dog Trolley-Duct, a flexible system of electric control for portable electric tools used on moving assembly lines, and Bull Dog Bus-Duct, a bus bar system of electric power distribution for industrial plants, are described in a recent bulletin of the **Bull Dog Electric Products Company**, 7610 Joseph Campau Ave., Detroit, Mich.

Steel Cabinets and Cutout Boxes—Bulletin No. B4 covering its entire line of steel cabinets and cutout boxes is being distributed by the **Federal Steel Products Company**, 2 Avenue L, Newark, N. J. Many data of use to electrical contractors and engineers are contained in the bulletin.

9-In. and Junior Lathes—Two bulletins, No. 9 and No. 22, recently issued by the **South Bend Lathe Works**, South Bend, Ind., describe respectively a 9-in. regular and a 9-in. junior lathe manufactured by that company. The bulletins contain complete specifications and prices of each of the lathes.

"Explosion-Proof" Motors—Bulletin No. 508 of **The Louis Allis Company**, Milwaukee, describes the Type E "explosion-proof" self-ventilated squirrel-cage motor designed by that company for use in the petroleum, lacquer, chemical, dry cleaning and other hazardous industries.

Waterwheel Generating Unit—Bulletin No. W207 recently issued by **The James Leffel & Company**, manufacturers of turbine waterwheels, steam engines and boilers, Springfield, Ohio, describes the design and construction of a self-contained waterwheel electric generating unit.

Crouse-Hinds Products — Condulets, groundulets, plugs and receptacles manufactured by the **Crouse-Hinds Company**, Syracuse, N. Y., are listed and described in the company's Catalog No. 2,200. Prices included are effective Nov. 1, 1929.

Commutator Maintenance—A publication designated as a "Commutator Maintenance Encyclopedia" has been issued by the **Ideal Commutator Dresser Company**, Sycamore, Ill., for distribution to electrical engineers and others interested in the subject. Besides a brief history of commutator maintenance, the book contains a chapter on the operation of d.c. generators, another entitled "Definitions of Electrical Terms," tables on the current carrying capacity of solid and stranded wires, on fusing, wiring and full load current data, directions for resuscitation from electrical shock, and detailed data on tools and machines in use in industrial, power and manufacturing plants.

G. E. Publications—Recent publications of the **General Electric Company**, Schenectady, N. Y., include:

GEA-1151: Mercury-Arc Rectifiers for Railway Service.

GEA-1155: Induction Voltage Regulators (single-phase).

GEA-1156: Induction Voltage Regulators (three-phase).

GEA-1183: Watthour Meters for Alternating Current.

GEA-1187: Engine-Temperature Indicator for Aircraft.

Grid-Glow Demonstration Set—Leaflet No. 20437 of the **Westinghouse Electric & Manufacturing Company**, East Pittsburgh, Pa., describes a demonstration involving the grid-glow tube, which can be used to operate almost any type of display or exhibit. A wiring diagram of a typical installation is given in the leaflet.

Theater Cooling Equipment — Description of a conventional theater cooling system is given in an issue of **"The Ideal Rotator"** for August, 1929, published occasionally by **The Ideal Electric & Manufacturing Company**, Mansfield, Ohio.

Allen-Bradley Catalog—The general catalog of the **Allen-Bradley Company**, manufacturer of electric controlling apparatus, Milwaukee, Wis., has been brought up to date by the issuance of several new bulletins and price sheets under date of July, 1929.

Enclosed Motors—The enclosed motor design of U. S. Uninclosed and Doublenclosed motors is described in a recent booklet of the **U. S. Electrical Manufacturing Company**, 200 East Slauson Ave., Los Angeles, Calif.

"Everything for Mine and Industrial Safety"—This is the title of Catalog No. 4 recently issued by the **Mine Safety Appliances Company**, Braddock, Thomas and Meade Sts., Pittsburgh, Pa.

ELECTRICAL WEST Barometer of Industrial Activity in Western States

Reports on the consumption of electrical energy by manufacturing plants in the Western states indicate that manufacturing during October was on a plane slightly below that at this time last year. The October rate of activity was 6.5 per cent under September and 0.7 per cent under October last year. The drop in rate of activity from September to October was very close to that witnessed during the same period last year. The average rate of operations of these plants during the first ten months of the year was 12 per cent above the same period last year.

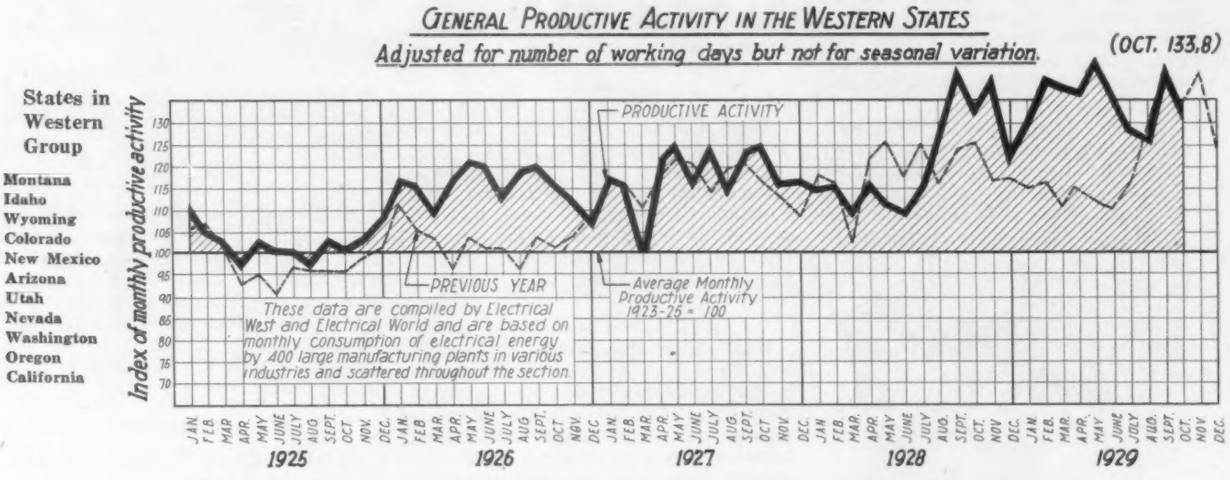
Nationally, manufacturing appears to be maintained on a slightly higher plane than in the Western states. The October rate of operations in the nation as a whole was 0.9 per cent under September but was 3.9 per cent above October, 1928.

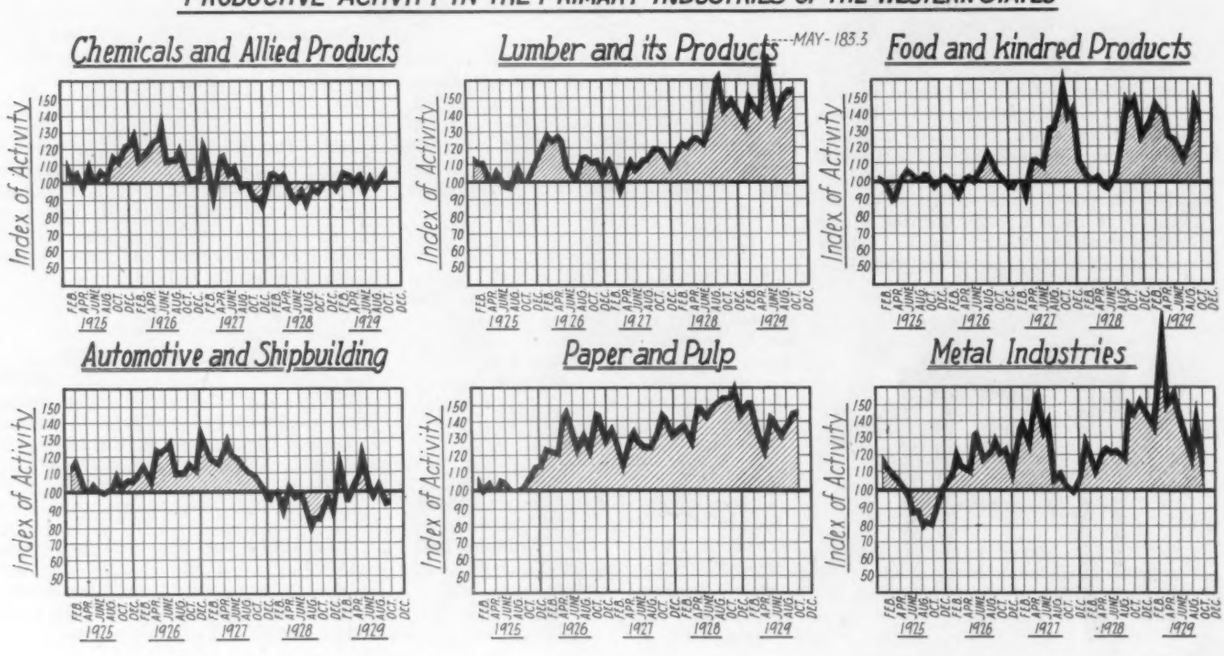
A study of the various industrial groups operating in the Western states indicates a wide variation in trend. Four of the leading manufacturing groups report increases over October last year, chemical products leading with 17.4 per cent, followed by shipbuilding with a gain of 11.8 per cent, stone, clay and glass 11.3 per cent, and lumber products 5.4 per cent. On the other hand, four equally important manufacturing groups of the West report an October rate of activity under that of October last year, the metals group leading the curtailment with a drop in productive activity of 19 per cent, followed by rubber products with a drop of15.7 per cent, paper and pulp 6.1 per cent, and food products reporting a drop of 4.3 per cent under October, 1928.

Indexes of Industrial Activity in the Western States

(All figures adjusted for number of working days.)

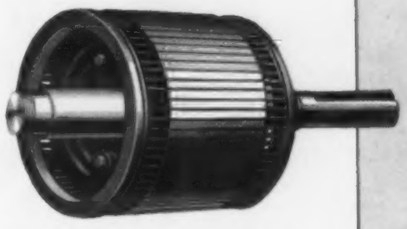
	Oct. 1929	Sept. 1929	Oct. 1928	Av. 1st 10 mos. 1929	Av. 1st 10 mos. 1928
All industry	133.8	143.1	134.8	136.0	121.5
Chemical and allied products	109.0	99.3	92.8	98.9	96.5
Food and kindred products	141.5	153.0	148.0	135.5	116.5
Metals group	120.2	151.4	148.7	149.4	129.2
Forest products	153.2	153.6	144.5	153.8	135.5
Paper and pulp	147.2	146.4	156.8	142.4	146.4
Rubber products	154.8	147.7	183.5	182.9	154.2
Shipbuilding	92.8	91.3	83.0	102.6	89.1
Stone, clay and glass	138.8	157.0	124.8	141.2	142.0



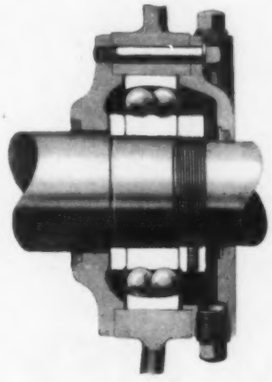


Note the weight of frame, broad heavy feet and compact construction

You have a right to expect this of motors—



Short, thick shaft; rotor bars and end rings fused into unit construction.



Once-a-year Lubrication

Sealed ball bearings require lubrication but once a year—further simplified by F-M Lubricant in measured tubes.

You have a right to look upon a motor as an investment. And as you judge a bond by its safety and yield, you have a right to judge a motor by its reputation for reliability and its yield in productive service. When you consider this sound method of evaluating electric motors price becomes a relative matter—the return in service per dollar invested becomes the determining factor of purchase.

Many leading plants have thus found that Fairbanks-Morse Ball Bearing Motors are "bargain" motors even though the initial price may be slightly higher than with sleeve bearing construction. They have found that these motors give a larger return in trouble-free service.

The greater value in F-M motors is not intangible. It is in the product itself and easily seen by the man who "knows motors." The responsibilities imposed by your service requirements are important enough that you inspect the actual motor. We are ready to arrange such an inspection in your plant at your convenience.

FAIRBANKS-MORSE MOTORS

Pioneer manufacturers of ball-bearing motors

FAIRBANKS-MORSE *Motors*

FAIRBANKS-MORSE *Motors*

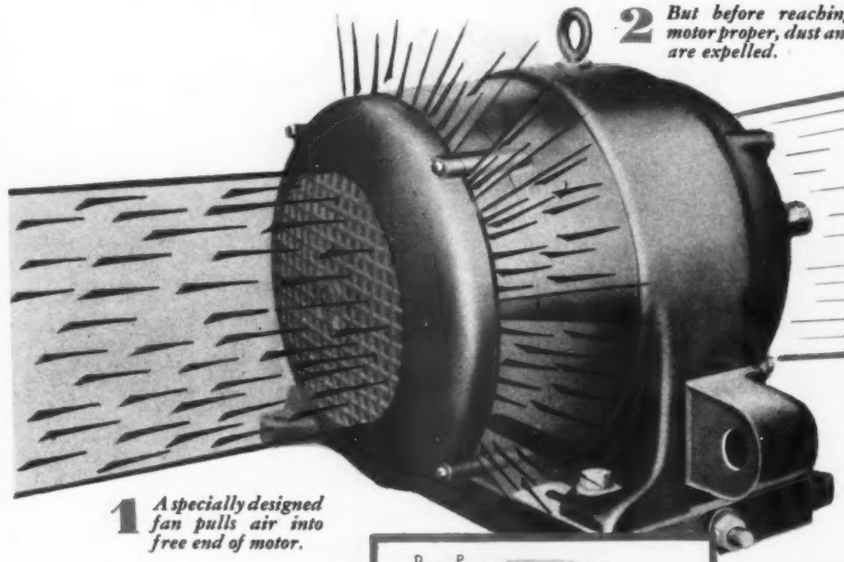
This motor *cleans its air before ventilating!*

An exclusive, patented feature of the Fairbanks-Morse Type HAC All-enclosed Motor! No breather and vent piping required—yet this motor supplies itself with pre-cleaned air.

A specially designed fan draws air into the free end of the motor—the fan is of such design that dust and dirt are immediately expelled and only clean air passes back through the motor ventilating spaces.

On the dustiest, dirtiest drive in your plant you can now have a fire safe, all-enclosed motor with no more installation cost than that of a standard, open type motor.

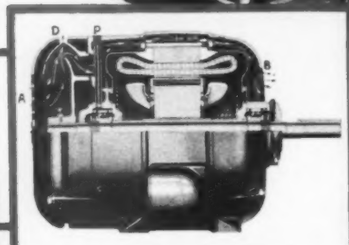
Be sure to write for full data on the Fairbanks-Morse Type HAC. Be prepared for your next installation requiring a dust-proof motor.



2 *But before reaching the motor proper, dust and dirt are expelled.*

1 *A specially designed fan pulls air into free end of motor.*

3 *Only clean, dustless air passes through the ventilating spaces and out the drive end of the motor.*



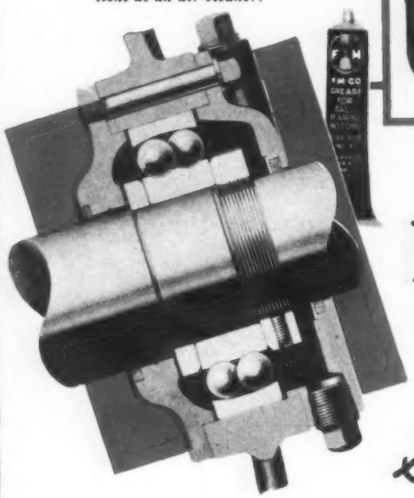
A *Air inlet at free end of motor.*

F *Specially designed fan which functions as an air cleaner.*

D *Vent for foreign particles thrown out centrifugally by fan.*

B *Clean air flows around winding shield and exhausts at opposite end of motor.*

P *Plunger device for greasing ball bearing without removing fan guard or bearing arms.*



EA40.23

FAIRBANKS-MORSE & CO., *Chicago*

32 branches at your service throughout the United States

FAIRBANKS-MORSE MOTORS

Grease only once a year

Large Rugged **ENOUGH** To Wire To Last

EXACT SIZE OF THE NEW

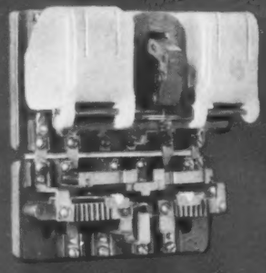
SUNDH ACLINESTOR

ACROSS THE LINE TYPE STARTER

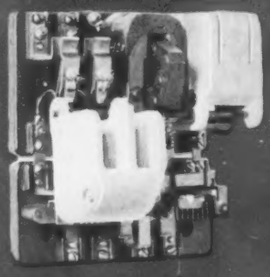
6013 Aclinestor Form M.A. full voltage automatic starter for remote control.

6013 Aclinestor Form M.B. full voltage automatic starter, manual, automatic, and off.

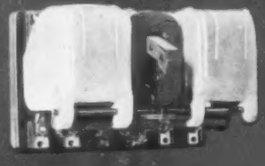
6013 Aclinestor Form M.C. full voltage automatic starter push button control.

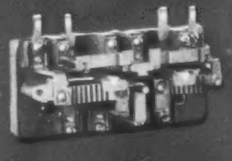


Interior of 6013 Aclinestor automatic push button switch. Note the simple, compact rugged construction, with ventilated arc-shields.



Switch above with arc-shield turned back for inspection of contacts. Switch or door cannot be closed in this position.





Switch and thermal relay are mounted on two separate cold molded bases.

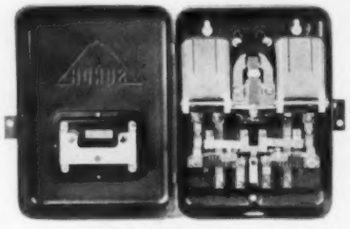
6013—the standard of comparison

Here is a switch by which all other starters can be compared. No testing is required. We have done that for you. It has been tested in air, in a salt bath, in a steam bath, for over load, for life of contacts, for every possible breakdown. We offer you this 6013 Aclinestor as a simple rugged dependable starter that has no superior. Price was not a consideration when we built 6013—it was built to the highest standard.

Note that there is plenty of room at top and bottom for wiring with plenty of knockouts. Also note that the connections go straight from line to load, that everything is compact yet not crowded, that start, stop and reset push buttons are straight through the box. No flexible leads.

Outstanding Features

1. Few moving parts.
2. Rugged construction throughout.
3. Famous Sundh quiet magnet.
4. No iron current carrying parts.
5. Cadinum plated parts throughout.
6. Contacts instantly removable by use of screw driver.
7. To remove coil, loosen 2 screws.
8. Ventilated arc shields of cold molded asbestos.
9. Bakelite molded contact support bar reinforced.
10. Switch and thermal relay on two separate cold molded bases.
11. Thermal overload reset from outside of box.
12. Switches complete in 3 and 4 poles.
13. Thermal overload adjustable for time interval.



Form M. C. Aclinestor with cover open.

14. Built to Underwriters' complete requirements.
15. Accessibility—coil—contacts and thermal relay elements instantly removable.
16. Push button recessed for protection.

Examine this 6013 Aclinestor

Only by examining this switch can you appreciate its superiority in design, construction and appearance. It meets every test and has interrupted stalled rotor current far in excess of its rated capacity. Ask us to send you a sample switch for inspection and trial.

SUNDH ELECTRIC CO., INC.

No. 5 Avenue C

NEWARK, NEW JERSEY

Sales Representatives in all Principal Cities

Today's motors must do *tomorrow's* work

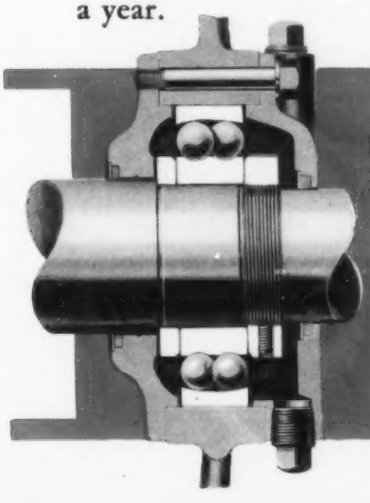
F-M Motors anticipate industry's ever increasing demands for higher production at lower cost.

F-M engineering vision has conceived a type of motor of high efficiency, with greater stamina, that is adaptable to a wider range of utility.

Each detail of their electrical design is an example of how well motors can be built. Every part is protected by an extra factor of safety. Ball bearings reduce friction of starting and preserve shaft alignment. These dust-proof, non-dripping bearings require lubrication but once a year.

In planning for reorganization or expansion, efficiency engineers are invited to investigate the advantages F-M Motors offer for increased production at a lower cost.

Fairbanks-Morse engineers welcome the opportunity of co-operating with power users in meeting the greater responsibilities of tomorrow's work.



FAIRBANKS-MORSE MOTORS

Pioneer manufacturers of ball bearing motors

FAIRBANKS-MORSE MOTORS

FAIRBANKS-MORSE *FLEX-MOR DRIVE*

Flex-Mor Drive

If you want a drive of superior mechanical efficiency; a drive equally efficient on short or long centers; a silent drive; a drive requiring no lubrication or dressing; a shock-absorbing drive; a drive unaffected by dust, dirt, moisture, atmospheric conditions; *then you need a Flex-Mor Drive!*

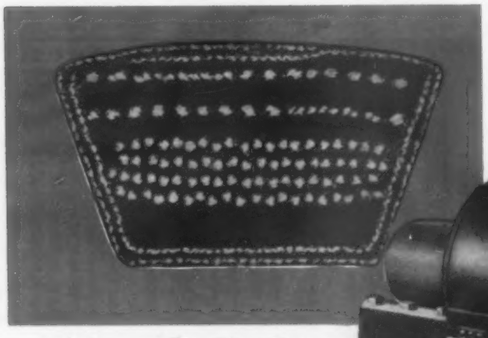
For Flex-Mor, with its "V" belt of rubber, cord and fabric offers a new freedom from power transmission troubles. Exclusive processes of manufacture produce a long wearing belt of such uniformity that even at high speeds there is no snaking or slapping as it moves over the sheaves. Under heavy loads the wedging action between the Flex-Mor belt and the sheaves increases the grip in proportion to the load—no slipping or burning.

Standardized drives consisting of Flex-Mor belts and sheaves are now available for practically all power requirements.

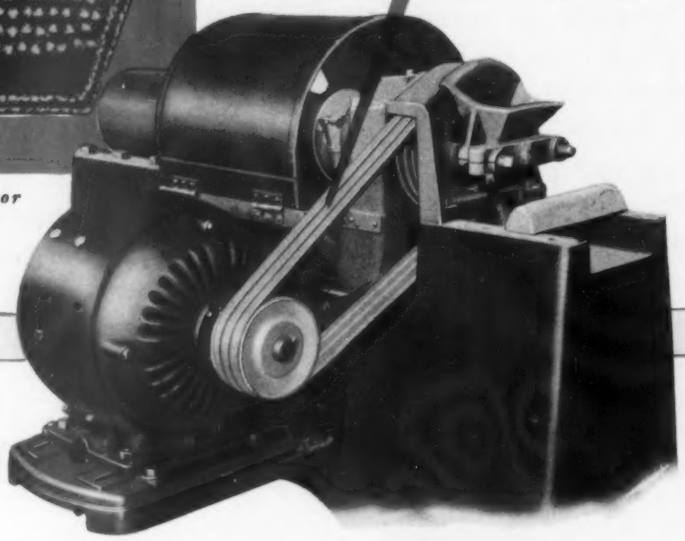
Write today for full details on Flex-Mor; get acquainted with trouble-free power transmission.

FAIRBANKS, MORSE & CO., Chicago

32 branches at your service throughout the United States



A close-up of a Flex-Mor cross section.



Flex-Mor Drive on a special casting machine

FAIRBANKS-MORSE

Flex-Mor Drive

EA40.28

Aloft and Alow

ALOW—The Condit M-9 Manhole Oil Circuit Breaker, stout and tight as a ship's hull—built to withstand the ravages of long continuous service below the surface. Furnished for either multi or single-conductor cable as required.

ALOFT—The Condit PK-9 Pole Line Oil Circuit Breaker likewise capable of riding out the fiercest onslaughts of the elements—ideal for outdoor service of moderate capacity.

"*Get in touch with Condit*"

CONDIT ELECTRICAL MFG. CORPORATION
Manufacturers of Electrical Protective Devices
BOSTON, MASS.

SPECIFICATIONS: *Types PK-9 and M-9 400, 600 and 800 amperes at 7500 volts. Estimated interrupting capacity 3000 amperes at 7500 volts. Non automatic or automatic.*

CONDIT

2219

LAPP INSULATORS

"Dan has the proof"

The Insulator of TODAY

When Dan, your line superintendent, comes to you, showing that on your line equipped with Lapp Insulators he had only one broken insulator in erection, that he has had no depreciation whatever for four years, that he has not replaced a single Lapp unit, that he knows Lapp Insulators are husky, that they have the date underglazed to help his records, that the metal is copper-bearing forged steel, that the porcelain is Lapp Vacuum Process, that he has never tested stronger units than Lapp, then back him up in his request for Lapp Insulators.

Dan is working for your interests—your Company's. He never went to Tech, never learned there that one make of insulators or another was then considered best. Besides, if he had, Lapp has come into the field since that time; the Vacuum Process wasn't known then. It is now!

Lapp Vacuum Process produces more responsible porcelain.

LAPP INSULATOR CO. INC. LEROY·N.Y.·U.S.A.

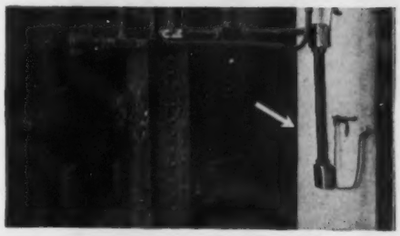
Pacific Coast Representatives—S. Herbert Lanyon, 210 Transportation Bldg., Los Angeles, Calif.; 509 New Call Bldg., San Francisco, Calif. W. R. Hendrey Co., Hoge Bldg., Seattle, Wash.

"SEVERE SERVICE"

the middle name of Chromalox HEATERS

Here production depends on continuous cherry-red heat. Chromalox strip heaters are mounted against the bottom of these tanks of tarry, insulating compound. Compound is kept at melting temperature. Heaters in operation over three years without breakdown!

Rain, fog, salty spray beat against these unprotected Chromalox strip heaters mounted under the trolleys of the Key Transit System, San Francisco. Used as resistance, connected in series with headlights, these strip heaters were found to be the only ones that would stand the strain of fluctuating voltage and vibration.



Two electrically heated oil heaters like this one, preheat fuel oil used in open-hearth furnaces of Pennsylvania steel plant. Chromalox strip heaters are clamped around each tank. No fire risks.

Photograph shows wide variety of strip heaters, single and 3-heat. Over 80 sizes quickly shipped from stock. 8" to 72" long, 150 to 1000 watts, 110 or 220 volts. Also Space Heaters, Narrow and Extra-Wide Strip Heaters, Ring Units, Immersion Heaters, Water Heaters, Air Heaters.

Preheating rolls in steel mills is one of the hardest jobs for electric strip heaters. With Chromalox units standard on all Freyn-Design roll heaters, there's no chance of unit failures halting production. Unit replacements run less than 1%.

THROUGHOUT industry you'll find Chromalox units working on the toughest heating jobs because they are built to withstand constant vibration, power overloads, fluctuating current, unreasonable operating conditions.

For instance: *Chromalox heaters have helped solve roll preheating in sheet and tin mills. Drying and baking ovens; tanks of compounds—glue, grease, tar; oils, solutions; batches of metal—on these and the thousand-and-one other applications where electric heat has proven its merit, Chromalox heaters are being used.

Pipe lines carrying oil, lead, compounds are kept from freezing-up by these quickly installed strip heaters. Preheating fuel oil; heating crane cabs, valve houses, etc.; used as resistance to take up induction kicks—Chromalox heaters are saving companies time and money by operating four and five years at a stretch without quitting.

Tell us about your particular heating jobs when writing for interesting bulletins on industrial and commercial heating. There's no obligation.

*Unit replacements run less than 1% on the more than 12,000 Chromalox strip heaters equipping nearly 200 Freyn-Design Roll Heaters.

★Over 150,000 Chromalox Strip Heaters are heating cars on over 120 railways—the toughest kind of work! The Railway Utility Co. of Chicago is the sole distributor of Chromalox Strip Heaters for use in heating railroad and street cars in the United States and Canada.

Chromalox ELECTRIC HEATING UNITS

Manufactured Exclusively by Edwin L. Wiegand Company, 7500 Thomas Boulevard, Pittsburgh, Pa.

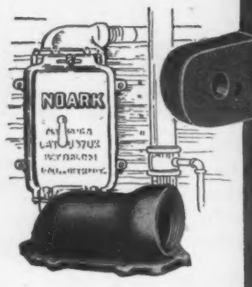
SOLE LICENSEES: Canadian Chromalox Co., Ltd., Toronto, Canada ABROAD: Geo. Bray Co., Leeds, England

Pacific Coast Representatives: THE ELECTRIC MATERIALS COMPANY, INC., 163 2nd St., San Francisco—443½ E. 3rd St., Los Angeles, Calif.
HARRISON SALES COMPANY, 314 9th Ave., North, Seattle, Wash.

Noark
Service Boxes

Straightaway entrance

Bushing plate for indoor open wiring



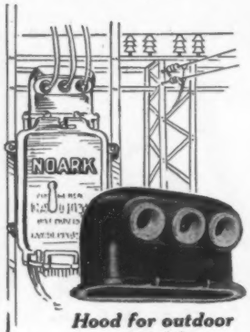
Left or right entrance

Split straightaway entrance

Back or front entrance

Fitting gasket

Split back entrance. May be filled with insulating compound

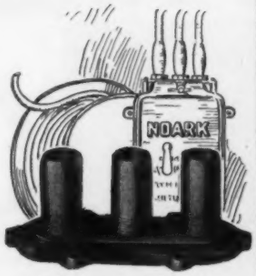


Hood for outdoor open wiring

Installation Accessories

THE proper selection of the fittings best adapted to the particular purpose for which the NOARK SERVICE BOX is to be used will go a long way toward making its installation as perfect — and as permanent — as the box itself.

The illustrations show some of the standard and more commonly used installation accessories. Special fittings can be developed as specified. Boxes and accessories are standard in 250 and 600 volts — 2 pole, 3 pole and 4 pole types, 30 - 600 amperes.



End plate with brass wiping sleeves for cable end

COLT'S PATENT FIRE ARMS MFG. CO.
ELECTRICAL DIVISION
HARTFORD, CONNECTICUT, U. S. A.
NEW YORK • BOSTON • PHILADELPHIA • CHICAGO • SAN FRANCISCO

33-W-8

ROCKBESTOS

—the asbestos insulated wire

ROCKBESTOS HEATER CORD

Cut to Length!

There are many advantages in buying heater cord cut to length.

You get nothing but perfect cord, carefully inspected and accurately cut to length.

There are no short ends left to waste, and in addition to the convenience of handling is added a definite saving in the cost of cutting, because we can do it cheaper than you.

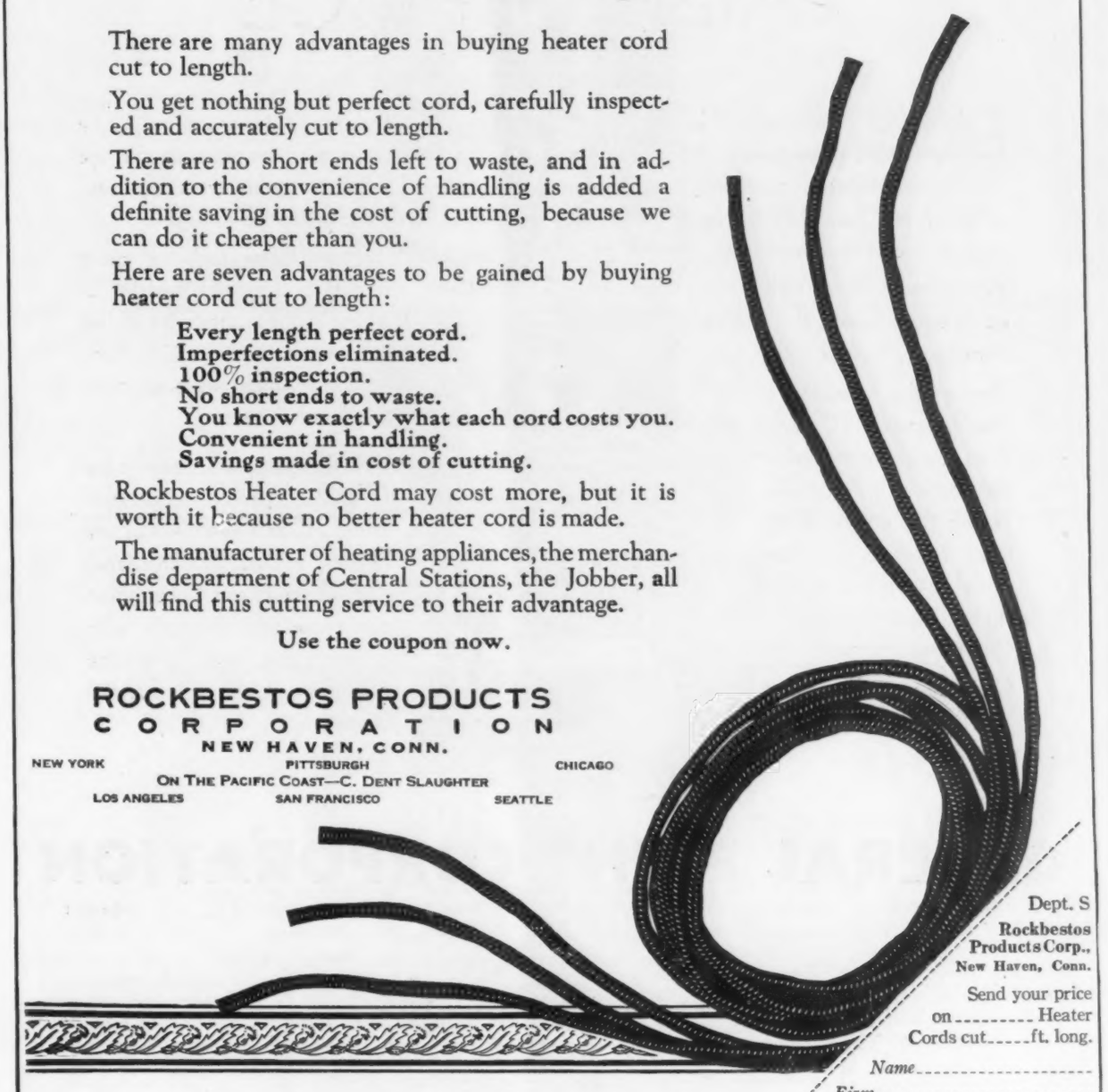
Here are seven advantages to be gained by buying heater cord cut to length:

Every length perfect cord.
Imperfections eliminated.
100% inspection.
No short ends to waste.
You know exactly what each cord costs you.
Convenient in handling.
Savings made in cost of cutting.

Rockbestos Heater Cord may cost more, but it is worth it because no better heater cord is made.

The manufacturer of heating appliances, the merchandise department of Central Stations, the Jobber, all will find this cutting service to their advantage.

Use the coupon now.



ROCKBESTOS PRODUCTS
CORPORATION
NEW HAVEN, CONN.
NEW YORK PITTSBURGH CHICAGO
ON THE PACIFIC COAST—C. DENT SLAUGHTER
LOS ANGELES SAN FRANCISCO SEATTLE

Dept. S
Rockbestos
Products Corp.,
New Haven, Conn.

Send your price
on _____ Heater
Cords cut _____ ft. long.

Name _____
Firm _____
Address _____

THROUGHOUT THE WEST A NEW STANDARD OF PAINT SERVICE

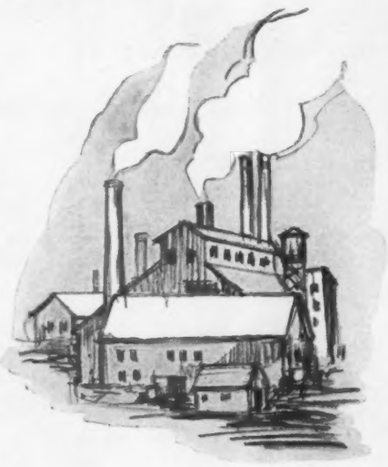
PRODUCTS manufactured by the nine★ companies now consolidated as The General Paint Corporation, have been adopted as "Standard" by large industrial users in the various territories.

Years of experience and testing have convinced Western buyers that the service behind these products is second only to their quality.

Through the formation of The General Paint Corporation...with a net-work of distribution facilities blanketing the entire West, these products are now available to industrial users throughout the Pacific Coast area.

Companies with far-flung Western interests, will find a distinct advantage in specifying The General Paint Corporation products that are being used satisfactorily in certain sections, as the paint standard for all divisions.

Companies that are facing technical paint problems, will find in the combined list of formulas assembled in the laboratories of The General Paint Corporation, a satisfactory solution which has been both tried and proved.

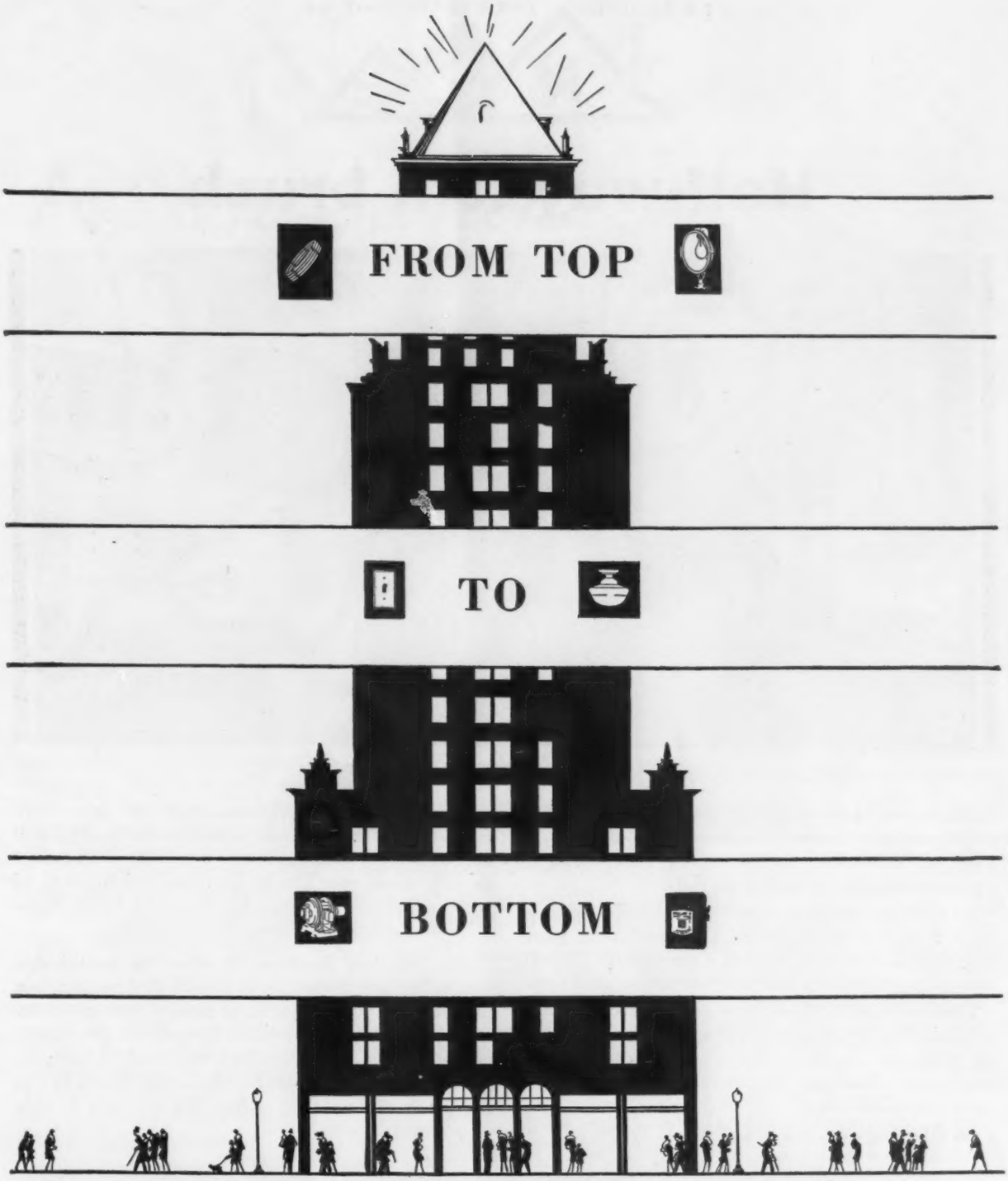


Whether your requirements are for beauty, protection or sanitation . . . or whether you are located in Butte or San Diego, The General Paint Corporation can serve you promptly with products that have earned the confidence of large industrial buyers.

GENERAL PAINT CORPORATION

SAN FRANCISCO LOS ANGELES HOUSTON PORTLAND SEATTLE NEW YORK OAKLAND HONOLULU TULSA SPOKANE

★ Names that have been synonymous in the West for quality products and service in paint since 1865, have been consolidated into the nine units of The General Paint Corporation. They are: Jones & Dillingham, Spokane; Seattle Paint Co., Seattle; Rasmussen & Co., Portland; Magner Bros. Paint Co., San Francisco; Hill-Hubbell & Co., San Francisco, Tulsa and New York; California Paint Co., Oakland; Brininstool Paint Co., Los Angeles; Technical Oil & Paint Co., Los Angeles and the Bradley-Wise Paint Co., Los Angeles.



MENTION anything electrical that goes into any building anywhere, and you've named a Graybar item . . . More than that. You've named an item that is available to you on quick demand through a nationwide distributing service which conserves not only your time but your need for excessive reserve stocks . . . You've named one of Graybar's 60,000 items . . . Graybar Electric Co., Executive Offices: Graybar Building, Lexington Avenue and 43rd Street, New York, N. Y. Offices in 71 Principal Cities.

GraybaR

Successor to *Western Electric* Supply Dept.

THE GRAYBAR TAG — SYMBOL OF DISTRIBUTION

SAN FRANCISCO SEATTLE LOS ANGELES OAKLAND SPOKANE PORTLAND TACOMA

◆◆ BEHIND THE PYRAMIDS—7 ◆◆

N C C

Half-way to a brush

One side of moulding department

HERE is one of the machines that produces the first semblance of a carbon brush—after more than 40 days of continual, uninterrupted manufacturing processes applied to raw materials.

Into this machine a milled and blended mixture of carbon and pitch is fed. The hydraulic press moulds this into large blocks. Pressures of 15 to 20 tons per square inch are necessary.

The products of these presses, however, are not brushes. Neither in size nor shape are they suitable. In order to give them the proper electrical and mechanical characteristics, baking, and other operations are required.

At this stage we are just about in the middle of the manufacturing process—over 40 days have passed since the lampblack was manufactured and approximately as much more time will be required to turn these raw blocks into finished brushes of such perfection that they can bear the NCC Pyramids and carry the Silver Strand Cable.

The National Pyramid Brushes we would ship you today are sawed from blocks that were made months ago, blocks that have passed through many other scientifically controlled operations. On receipt of your order, your brushes are made exactly to your specifications from brush blocks stored in our several factories. That is how we are able to ship so promptly.

An interesting moving picture film illustrating in detail the processes used in the manufacture of carbon brushes will gladly be shown on request to any organization of engineers or students.

NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide UCC *and Carbon Corporation*

Carbon Sales Division — SILVER STRAND CABLE TRADE MARK REGISTERED — Cleveland, Ohio

Branch Offices and Factories

New York Pittsburgh Chicago Birmingham San Francisco

NEWS!

A *New Switch* . .

. . With a new form of contact spring which prevents burning of contacts at "make" . . . . . *even in circuit with type "C" lamps*

FOR months a staff of electrical engineers, technicians and designers have been at work at a single task in the Hubbell laboratory. They had been instructed to design a new toggle switch — electrically and mechanically perfect.

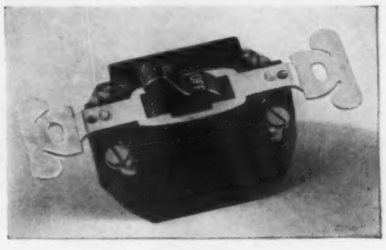
This was no simple assignment. Before them lay many problems. Most important of these was the elimination of burning of contacts at the "make" when controlling type "C" lamps — the most frequent cause of switch failure. This necessitated the development of a radically different design which would provide for the enormous inrush of current at the instant of "make".

Opened for your inspection here is the achievement of this staff. For they have succeeded . . . they have solved every problem . . . they have provided a toggle switch, electrically and mechanically perfect in every detail. This switch has successfully passed the severest tests. It is truly a product worthy of the name of the pioneer manufacturer of wiring devices.

We are confident that you will give this new Hubbell Shallow Flush Toggle Switch your enthusiastic approval. You will understand our confidence when you check over the outstanding features listed here. *A complete* line of these new switches is ready to meet every need. The coupon will place a detailed description on your desk.

HARVEY HUBBELL, INCORPORATED
BRIDGEPORT, CONNECTICUT

Boston, Mass.; 176 Federal St.; Atlanta, Georgia, H. C. Biglin, 138 Marietta St.; New York, N. Y., 122 East 42nd St.; Chicago, Illinois, 318 West Washington St.; Denver, Colo., T. H. Bodfish, 1109 Broadway; Philadelphia. Pa., Fifth St., Philadelphia Bourse, (Exhibition Dept.)



Electrically and Mechanically Perfect in Design—*"Approved"*

A radically new form of contact spring scientifically designed so that two different rates of vibration are set-up in the spring; one tending to counteract the other. Thus recoil is practically eliminated in the ends of the contact spring when the solid metal contact blade strikes between them. As a result, burning and pitting of the spring is prevented — even when in circuit with type "C" lamps.

An automatic "kick off" prevents sticking of blades in contact.

A perfectly insulated commutator support.

Commutator blades rigidly riveted to carrier, insuring positive alinement.

Spring arm is pivoted on a round shaft, seated in a symmetrical bearing, facilitating faster, smoother action without wear.

Operating mechanism is separate from the bridge and perfectly insulated.

A solid bridge with ear lies in a recess across Bakelite cover — entirely insulated; perfect alinement and rigidity insured.

Each wiring terminal is held by two screws.

Bakelite case completely encloses mechanism.

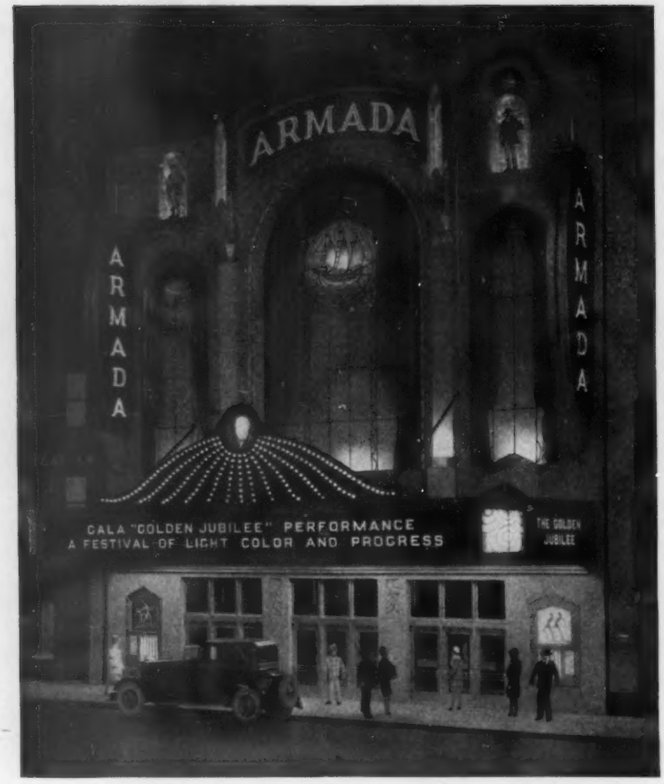
HUBBELL
Toggle Switches

Please send information on Hubbell Toggle Switches

Name_____

Address_____

City and State_____ E.W. 7-29



Put Your Town
on the
Light Map
of
America

Atlantic City Has Paved the Way

THE N. E. L. A. Convention—what a thrill it was! Evening promenades on the Boardwalk, underneath a myriad golden clusters . . . the varicolored fountain of light . . . jewelled arches . . . pearly pendants of incandescent lamps in fetching design . . . the waves of the Atlantic floodlighted in red, green, gold . . . what a thrill!

Thus Atlantic City ushered in *Light's Golden Jubilee!* Thus the nation's playground paid homage to Thomas Alva Edison, and paved the way for the mighty tribute of a nation.

The community you serve is eager to join in that tribute. Local gala days in your community will offer opportunities to celebrate this golden anniversary of light repeatedly during the Summer and Fall. The central station should be the motivating, organizing force behind community celebrations.

The Plan Book of *Light's Golden Jubilee* has suggestions for you in every problem. It will spur your originality—be sure you get a copy immediately. You ought to make good use of Jubilee publicity aids, including replicas of Edison's first lamp, Jubilee symbols for letterheads and advertising, special window displays and reprints of the *New York Herald* that chronicled Edison's invention back in 1879.

Atlantic City has ushered in *Light's Golden Jubilee*. The nation has taken up the call. Your community will certainly want to play a part in this greatest of all tributes to a living genius. Take the lead.

EDISON MAZDA LAMPS
General Electric
HARRISON, N. J.

NATIONAL MAZDA LAMPS
CLEVELAND, OHIO

The Miracle of 1929

5 Horse Power Century Type RS
Repulsion Start Induction Single Phase Motor

Continuous Operation

Century Motors (brush-lifting type) "Keep a-Running" because of their well-balanced starting and operating characteristics, liberal design, accurate workmanship and thorough insulation against dampness and humidity.

Built in standard sizes from 1/8 to 40 horse power. Temperature rating, 40° C.

CENTURY ELECTRIC COMPANY
1806 Pine St. St. Louis, Mo.

40 U. S. and Canadian Stock Points and More Than 75 Outside Thereof

Century MOTORS

"THEY KEEP A-RUNNING"

HOT WATER

...without pre-heating!

Industrial Plants offer you a ready market for this tankless heater..

Ready hot water is required in the First Aid Rooms of all industrial plants. Here's a device that assures hot water for every emergency—without the expense of keeping it hot! Turn the tap left . . cold water. Turn it right . . in three seconds the cold water runs steaming hot! Turn it straight up . . water and current are shut off. Heating cost stops.

The Instantaneous Electric Heater is needed now in First Aid Rooms, homes, factories, offices, camps, barber shops, beauty salons, hospitals, schools, small hotels, gas stations, farms—wherever hot water is needed at the turn of the tap. More than 20,000 are already in service!

This device involves no special plumbing—no special wiring where there's a suitable power circuit. It's just connected to AC or DC current and the cold water supply . . . a quick job for any good mechanic. It is made in 1, 4, and 12 faucet types, fully guaranteed, and approved by the testing laboratories.

It's worth your while to get full details on flow, temperature, operating costs, prices and *profits*. Send the coupon to your nearest representative.

Important Notice

Due to confusion resulting from a similarity between the established Acorn trade-mark used by Harvey Hubbell, Inc., and an Acorn trade-mark used by a western range manufacturer, it has been decided to change the name of the Acorn Heater Corporation to The Electric Heater Corporation, and to omit the Acorn trade-mark from our Heater advertising.

There will be no change in construction, policy or personnel. The Instantaneous Electric Heater advertised on this page is identically the same heater previously established over the signature of the Acorn Heater Corporation.

(Signed)

THE ELECTRIC HEATER CORP.
Harvey Hubbell, Jr., President

Main Office: The Electric Heater Corp., Bridgeport, Conn.

Pacific Coast Representatives:
Clyde L. Chamblin Co., 639 Mission St., San Francisco, Calif.,
The Demmert Co., 106 West Third St., Los Angeles, Calif.

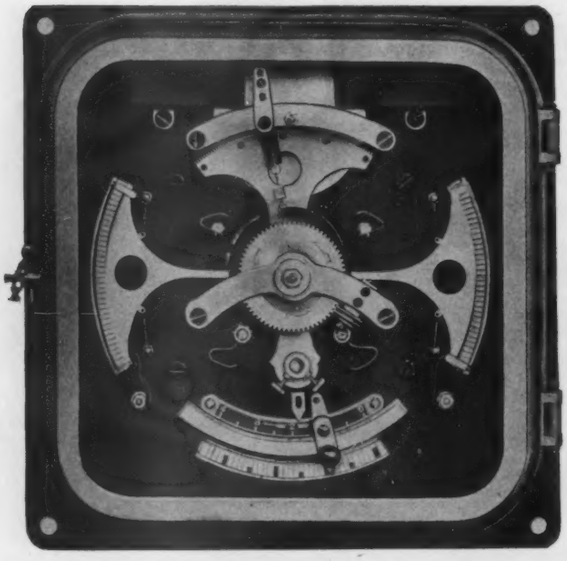
INSTANTANEOUS Electric HEATERS

INSTANTANEOUS

THE ELECTRIC HEATER CORP., BRIDGEPORT CONN.
Branch Offices: New York, Chicago, Boston and H. C. Biglin, Atlanta, Ga.

Please send me full particulars regarding the Instantaneous Electric Water Heater. E.W. 7-29

Name _____
Address _____
City _____ *State* _____



Once a year they wash the window

There's an A. B. B. automatic voltage regulator on the job at a famous power station in New York State.

We asked one time about the maintenance necessary. After due deliberation, the answer came:

"We wash the window once a year."

Freedom from maintenance, freedom from shut-downs, freedom from noise, freedom from vibration—all characteristic of the A.B.B. automatic voltage regulator. And besides, it *does* regulate voltage, instantly, dependably.

AMERICAN BROWN BOVERI

AMERICAN BROWN BOVERI COMPANY, INC., CAMDEN, N. J.

Utilities Equipment Corporation
1643 Russ Building
San Francisco, Calif.

Thomas S. Wood
507 Polson Building
Seattle, Wash.

Utilities Equipment Corporation
401 Bartlett Building
Los Angeles, Calif.

Announcing

Hotpoint

HI-SPEED CALROD

The Fastest
Electric Range Unit
In The World

EDISON ELECTRIC APPLIANCE CO., Inc.

A GENERAL ELECTRIC ORGANIZATION

Airport Lighting a *new* field

AIRPORT Lighting provides a fertile, profitable field for Electrical Contractors. Diamond E engineers after intensive study, research and experience are in a position to furnish the best possible electrical service-advice to contractors interested in this latest development. Diamond E magnetic switches, Switchboards, Panels, Wiring Gutter and other *high quality* products are especially adaptable to Airport Lighting installations. A notable example is the Municipal Airport at Oakland, California, where Diamond E products were used extensively. *Definite information and specifications on Diamond E equipment suitable for any proposed Airport Lighting job will be furnished upon request. . . .*

FACTORIES
Los Angeles, Calif.
1318-1362 E. 16th St.

Houston, Texas
1517 Fannin St.

DIAMOND ELECTRICAL MANUFACTURING COMPANY INC.
Associated Manufacturers

FACTORIES
Milwaukee, Wis.
926 Juneau St.

San Francisco, Calif.
1264 Folsom St.

Distributing Office
Portland, Oregon
218 Commonwealth Bldg.

Union Electric Mfg. Co.
Milwaukee, Wisconsin
Sales Offices and Stock

Distributing Office
Salt Lake City, Utah
228 South West Temple St.

Cleveland, Indianapolis, Detroit, Buffalo, Baltimore, New York, Philadelphia, Boston, Toronto, Montreal, St. Louis, Toledo, Grand Rapids, Chicago, Cincinnati, Pittsburg, New Orleans, Birmingham

ANACONDA
from mine to consumer
REG. U.S. PAT. OFF.

From Our Mines to Your Wiring Jobs!

— another reason why Electrical Contractors can depend on the Quality of these Durabilt Wiring Materials.

DURAWIRE
Rubber-Covered Wire and Flexible Cords

DURAFLEX
Armored Bushed Cable and Flexible Steel Conduit

DURACORD
The Lacquer-Finish Heavy-Duty Portable Cord

DURADUCT
The fast-fishing Single-Wall Loom

DURAX
The Non-Metallic Sheathed Cable of Known Quality

Order Durabilt Products by Name from Your Wholesaler

DURABILT PRODUCTS
REG. U.S. PAT. OFF.
Speed up wiring jobs

ANACONDA WIRE & CABLE COMPANY

General Offices, 25 Broadway, NEW YORK
Chicago Office, 111 West Washington St.

Pacific Coast Offices

336 East 4th Street, Los Angeles
314 12th Street, San Francisco
524 First Ave. So., Seattle

Elpeco's Porcelain Base Switch Family

100 Amp.
200 Amp.
300 Amp.

Single Pole S. T.
For General Distribution, Disconnecting, Potential Transformers, Fuses, etc.

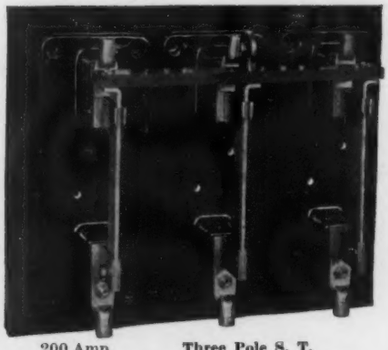
100 Amp.
200 Amp.
300 Amp.

Single Pole D. T.
For Double Buses, etc.

100 Amp.
200 Amp.
300 Amp.

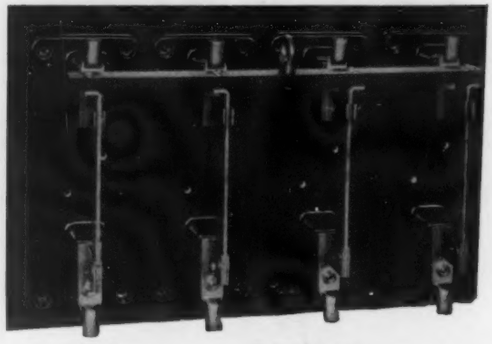
Double Pole S. T.
For Transmission Telephones, Single Phase Motors and Transformers.

"This fills a long-felt want"



200 Amp.
300 Amp.

Three Pole S. T.
For Three Phase Motors. Service Entrance.



200 Amp.
300 Amp.

Four Pole S. T.
For Two Phase Motors Service Entrance, etc.

AN engineer for a prominent steel company made this remark when shown ELPECO'S porcelain base switch family—Think of being able to purchase single pole and multiple pole switches in *both single* and *double* throw types that are good for a maximum working voltage of 6,600. Especially adapted for central stations, industrial plants, mines, etc.

Can be used in connection with high voltage motors and for disconnecting transformers, service entrances, etc.

Made in 100, 200 and 300 amperes.

Listed in Bulletin No. 101-B.

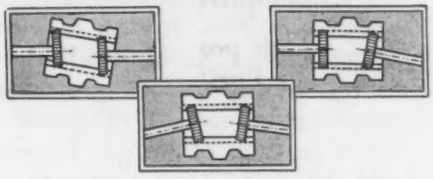
See ad Jan. 5, 1929, Page 129, Electrical World

for the good of the Service

ELPECO
ELECTRIC POWER EQUIPMENT CORPORATION
412-420 NORTH EIGHTEENTH ST. PHILADELPHIA, PA.

Western Representatives: C. E. INGALLS, Rialto Bldg., San Francisco, Calif. EICHER & BRATT, 570 Colman Bldg., Seattle, Wash.

Pacific Coast Stocks



Two spur gears, one on each shaft end, are completely and continuously meshed in oil with the internal gears of a floating sleeve. The shafts and sleeve revolve noiselessly as one unit, allowing free angular and lateral movement.

YOU will be interested in knowing that factory stocks of FAST'S Self-Aligning Couplings are now on the Pacific Coast, in the hands of the following:

PORTLAND:
Gerlinger, Stevens Company

SAN FRANCISCO:
Jones-Lyman & Company, Inc.

LOS ANGELES:
Thomas Machinery Company

These stocks are rough-bored, and will be finished to meet installation requirements.

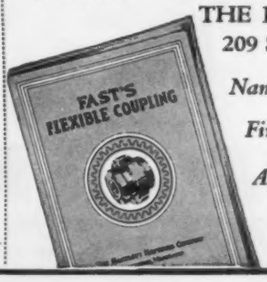
Full information and prices are immediately available by communicating with any of the above-named houses.

If you do not now have the FAST'S catalog in your files, sign and mail the attached coupon and we shall be glad to send you a copy. This catalog shows a great variety of coupling applications, with dimension tables, rating tables, and other valuable information.

FAST'S
Self-Aligning
COUPLING

Please send me Free Book

Mail The Coupon Today



THE BARTLETT HAYWARD CO.
209 Scott Street, BALTIMORE, MD.

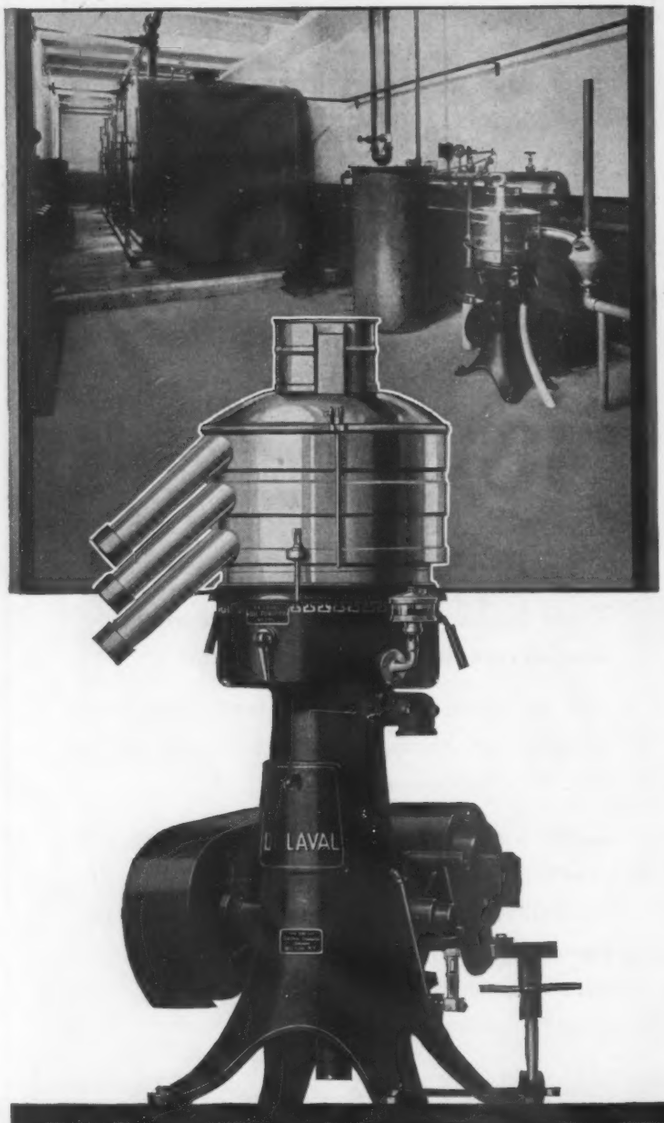
Name.....

Firm Name.....

Address.....

City..... *State*.....

INSURING OIL PERFORMANCE ON A GREAT HYDRO SYSTEM



ELECTRICAL energy generated in the three great hydro plants of the Gatineau Power Company, on the Gatineau River, is handled through transformers and circuit breakers insulated with De Laval-purified oil.

Although portable De Laval Insulating Oil Purifiers are also used, the principal sub- and switching stations are equipped with stationary De Lavals pipe-connected to the oil insulated apparatus. These installations provide the easiest, most economical and most rapid means of purifying oil from groups of large transformers and breakers.

De Laval has solved your problem of insulating oil maintenance, too. Standard portable equipment, trailer-mounted outfits and stationary units are built in sizes for every system, but to one standard of efficiency—the highest.

Write for Bulletin 107-E giving full details.

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York
600 Jackson Blvd., Chicago

DE LAVAL PACIFIC COMPANY, 61 Beale Street, San Francisco
THE DE LAVAL COMPANY, Ltd., Peterborough, Winnipeg, Canada
ALFA-LAVAL CO., Ltd., 34 Grosvenor Road, London, S. W. 1.

DE LAVAL OIL PURIFIER

Keeping step with the changes that follow modern needs

ALIVE industry that wants to keep on living must constantly change. New conditions, new inventions, new markets bring new demands. The producer who is alert to modern needs—who can assist his customers and allied industries to meet those needs, contributes greatly to progress.

By close contact and cooperation with Central Stations and other wire and cable users for almost half a century, this company has gained the confidence of the industry to an enviable degree.

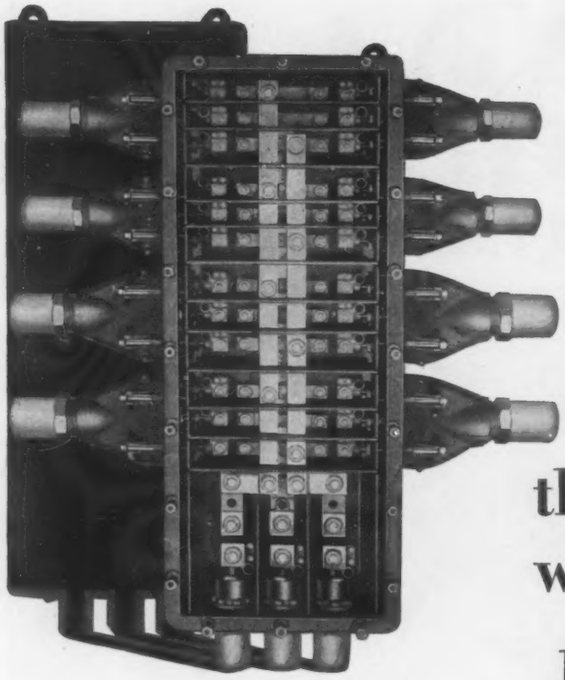
Unceasing research and careful study of developments in the electrical industry have enabled Standard to produce a full line of wires and cables to fit the demands of the day.

Whether for underground, submarine or overhead use—large cables or small wires—you can have complete confidence in all Standard products.

We welcome inquiries—for engineering cooperation, for general information, for specifications, or for prices.

STANDARD UNDERGROUND CABLE CO.,
Division of General Cable Corporation
Perth Amboy, N. J.

STANDARD
UNDERGROUND
CABLE COMPANY



STANDARD—
the only junction boxes with bi-metallic nipples

IT'S a lot easier to connect a cable to a Standard box because of this patented feature. And there's less risk of injury to the cable.

The patented bi-metallic nipple consists of a brass bushing to which a lead sleeve is joined by a special factory process.

This lead sleeve is easily dressed to fit the cable sheath, making possible a lead to lead wiped joint — a far simpler and quicker process than wiping lead to brass.

Features such as this are found throughout the Standard Line of Accessories. They offer further proof that Standard Accessories, whether Junction Boxes or Terminals, are designed by engineers who understand their uses in the field.

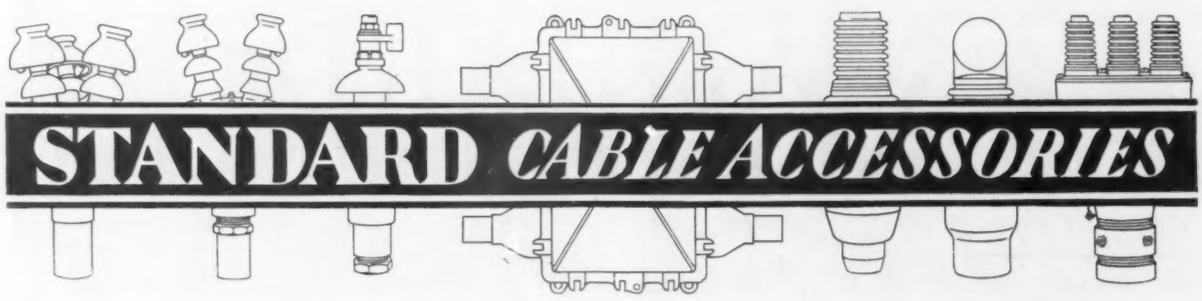
Standard Accessories Catalogs are also built from the users' standpoint, practical in every sense of the word. If you would like copies, we will be glad to send them upon receipt of your name and address.

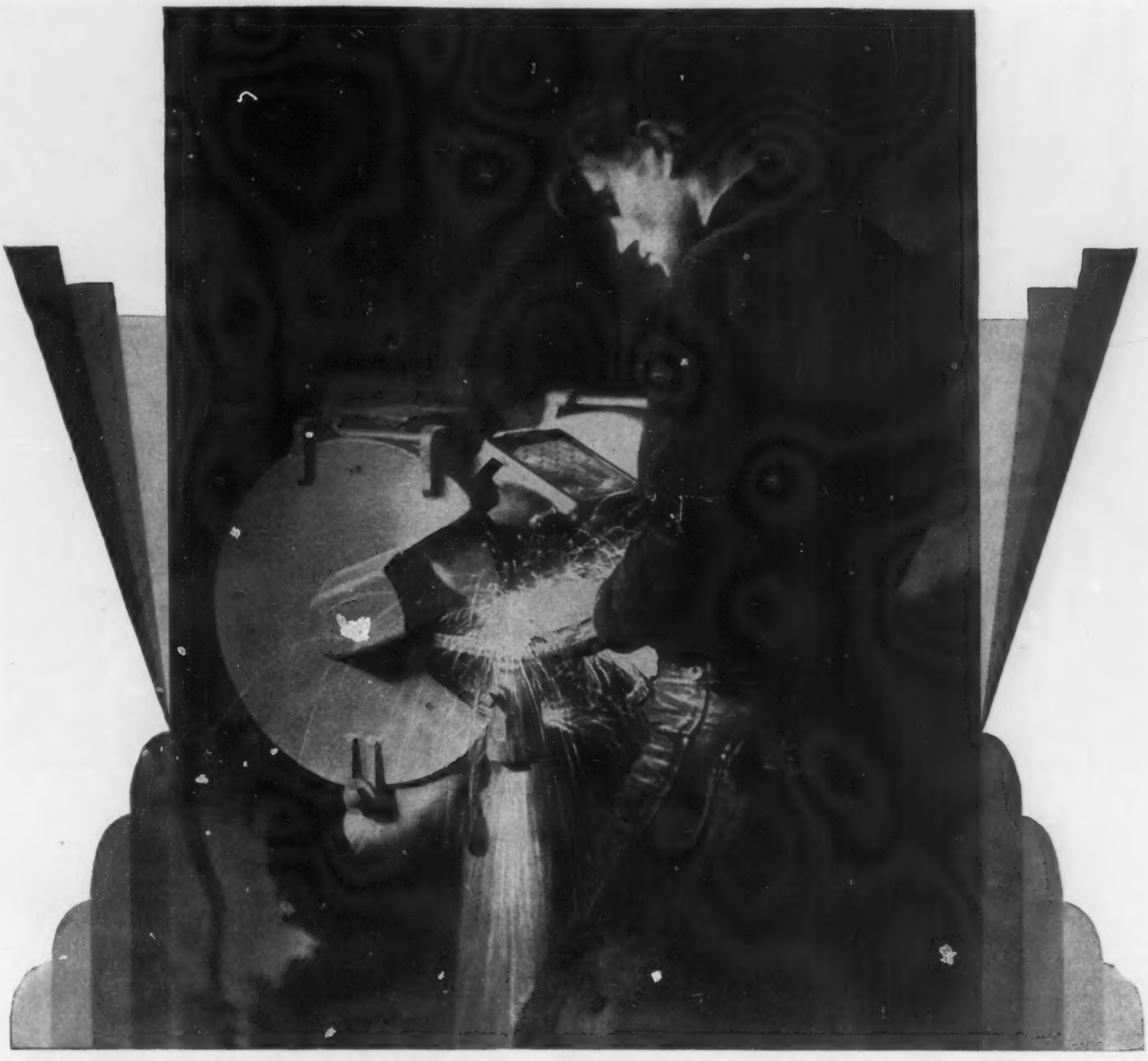
STANDARD UNDERGROUND CABLE COMPANY
PERTH AMBOY, N. J.

SAFETY CABLE COMPANY
NEW YORK, N.Y.

ROME WIRE COMPANY
ROME, N.Y.

Divisions of General Cable Corporation





Sparkling Performance

FAST, clean grinding is inevitable with rigid and true-running New Departure-mounted spindles, and the accuracy of these bearings is directly reflected in the better quality of work produced. Realizing this, the U. S. Electrical Mfg. Company, in their line of grinders, have equipped the inbuilt U. S. Motors with New Departure Ball Bearings. A careful exclusion of grit and dirt gives added assurance to the user of long, economical performance. The compactness of New Departures, their freedom from wear and lubricating difficulties, are some of the characteristics which make them so ideal for machine tools and electric motors. Why not avail yourself of our engineering service?

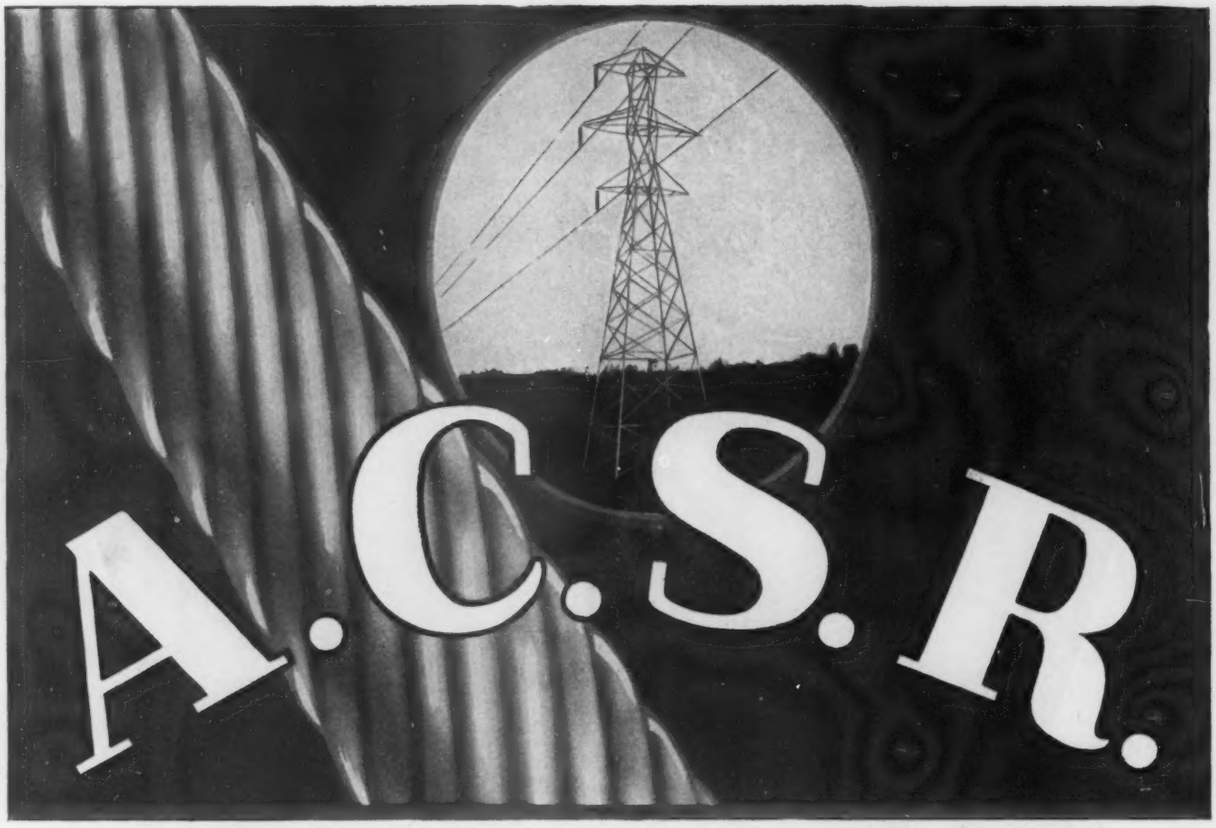
The New Departure Mfg. Co., Bristol, Connecticut.

NOTHING ROLLS LIKE A BALL—IN

NEW DEPARTURE

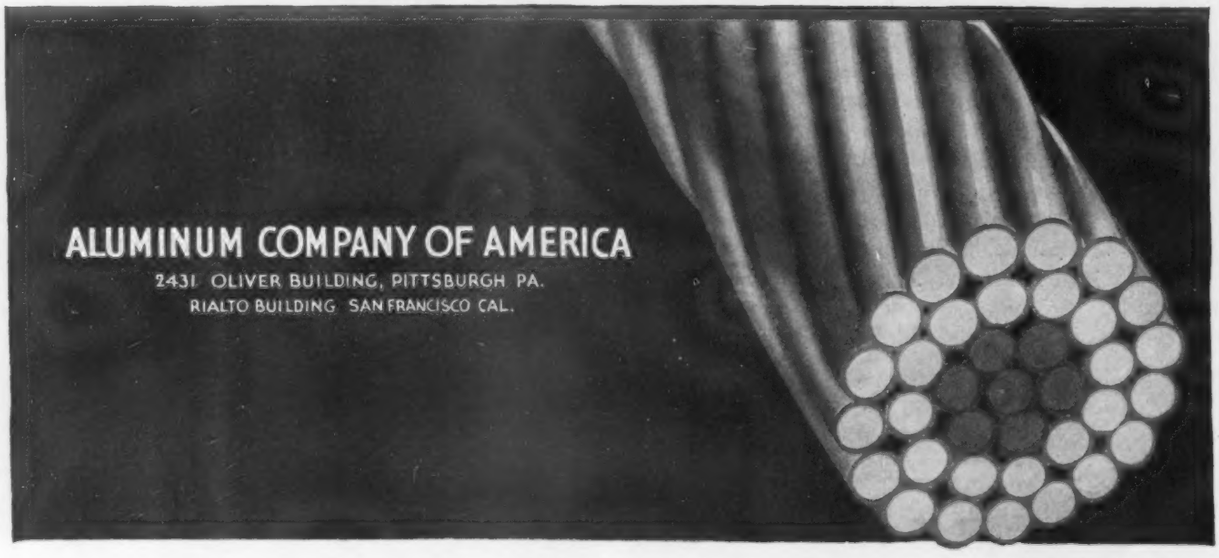
BALL BEARINGS

1326



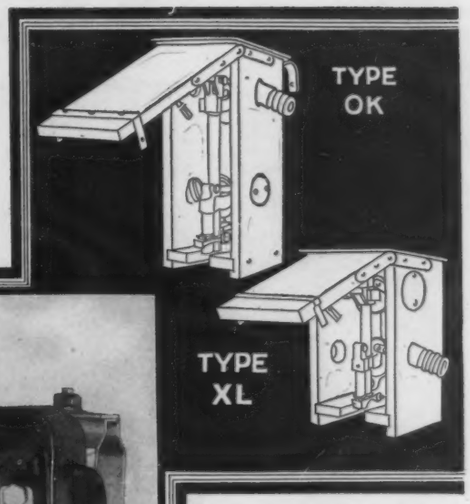
SINCE 1910 when the first high voltage installation of A. C. S. R. was made on the Big Creek lines of the Southern California Edison Company—the hour glass has poured off more than 165,000 hours—more than 19 years . . . At the time this line was erected A. C. S. R. was the natural choice for high voltage lines. Now it is in demand for low voltage lines as well. In fact, of the 280,000 miles of A. C. S. R. installed, more than two-thirds is on low voltage transmission.

A.C.S.R.
ALUMINUM

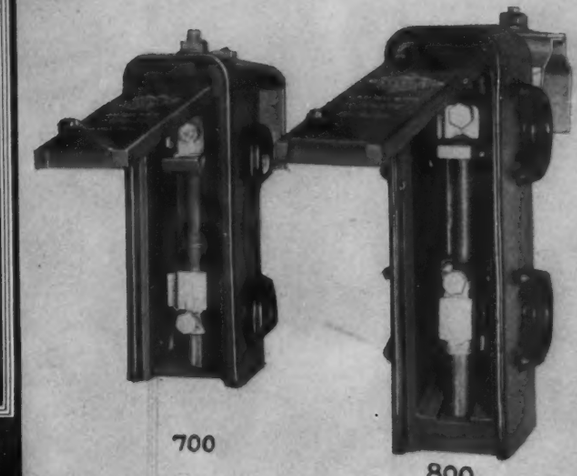


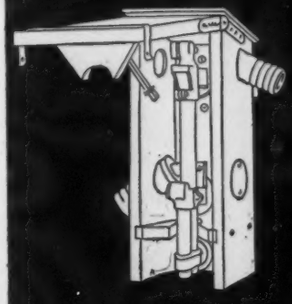
MATTHEWS FUSWITCHES

Wet Process Porcelain Housing ...Tide Water Cypress Housing



The Type HQ Matthews Fuswitch is recommended for fusing requirements where exceedingly large short circuit currents are likely. It is used extensively for large power transformer protection, and branch line protection where the normal load is over 100 amperes per phase. In many cases it is used in place of the more expensive oil switches. Rating: 200 amperes, 7500 volts delta. Housed with Tidewater Cypress and has a guaranteed rupturing capacity 40 times rating.





The type XL Matthews Fuswitch is recommended for transformer and branch line protection where the fusible element required is not greater than 50 amperes, also for automatic train control systems where voltages are less than 5000 volts. Rating: 50 amperes, 5000 volts delta.

The Type OK Matthews Fuswitch is recommended for transformer and branch line protection where the normal load current does not exceed 100 amperes. Also for transformer protection on automatic train control systems of over 2400 volts and below 7500 volts. Rating: 100 amperes, 7500 volts delta.

Both these Fuswitches are housed with Tidewater Cypress and have guaranteed rupturing capacities of forty times ratings.

The 700 and 800 Matthews Fuswitches are housed with genuine wet process porcelain. The 700 is rated at 60 amperes 2500/4400 Y volts; rupturing capacity 3000 amperes at 60 cycles. The 800 is rated at 60 amperes, 7500 volts; rupturing capacity 4000 amperes at 60 cycles. Both these Fuswitches have adjustable hangers. Here are some of the outstanding features of Matthews Fuswitches: convertible to disconnecting switches by replacing fuse cartridge with special disconnecting blade; doors free from live parts; inspection without interruption of service; no radio interference. For additional information send for Bulletins.

W. N. MATTHEWS CORPORATION

Engineers and Manufacturers

3708 Forest Park Blvd. , , Saint Louis, Missouri

Offices In All Principal Cities 2

W.N. MATTHEWS CORPORATION ST. LOUIS, U.S.A. ESTABLISHED

MATTHEWS ELECTRICAL SPECIALTIES

THE LEAD TIP IS "BONDED" ON

You may have a copy of "Lead Tip Steel Pins", more generally called Booklet 516-H. If not, you need this source of valuable information. Send for it.

The advantage of the use of lead tip pins is fully recognized. The unfortunate experiences which have occurred with loose tips were the result of improper application of the lead tips, which came loose in time, or indeed, may never have been tight.

But, if the lead tip is correctly applied, it becomes a permanent part of the shaft of the pin and never looses its grip or loosens. It is more than just casting the lead on the roughened end of the pin. Proper fabrication must develop a bond so firm and solid that neither time nor stress can loosen it. Yet the finished pin must hold the insulator securely and provide a cushioning effect to protect the porcelain from mechanical and thermal strains.

Operating men, whose experience has covered trouble with loose tips, and who now find freedom from trouble with O-B Lead Tip Pins, emphatically endorse the patented O-B method of lead tip application. Booklet 516-H covers this feature in detail. Please send for your copy.

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co., Limited
Niagara Falls, Canada
1055-H

Ohio Brass Co.

NEW YORK PHILADELPHIA CHICAGO BOSTON PITTSBURGH ST. LOUIS ATLANTA SAN FRANCISCO CLEVELAND LOS ANGELES

PORCELAIN INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
VALVES

San Francisco, 215 Market St.

Los Angeles, 417 So. Hill St.

Transformer Tap Changer

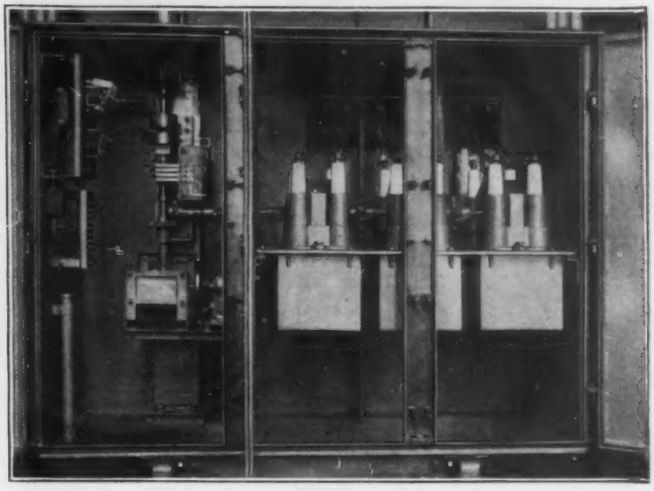
for operation under load

THE Allis-Chalmers tap changer for operation under load is used to regulate the voltage or phase angle of a power circuit without disconnecting the load. It is suitable for either single phase or three phase operation and the taps may be on either Y connected or delta connected windings.

This tap changer may be operated by hand or by motor. When motor operated it may be controlled by push button at the transformer or at a distant control station, or it may be controlled by a contact making instrument. The mechanism, when started by the master switch, will continue to operate until one tap change is made and then it will automatically stop. Tap position indicators may be located at the control station and at the transformer.

The tap changer consists of oil circuit breakers which make and break all power circuits during a tap change cycle, oil immersed rotating switches that change the tap connections only when the circuit through them has been opened by the oil circuit breakers, control mechanism that moves and interlocks the various parts in the proper sequence and preventing reactance.

20,000 KV-A single phase water cooled Transformer with Tap Changer.



Control Mechanism of Allis-Chalmers Tap Changer for three phase Transformer.

ALLIS-CHALMERS

MILWAUKEE, WIS. U.S.A.

PACIFIC COAST OFFICES:

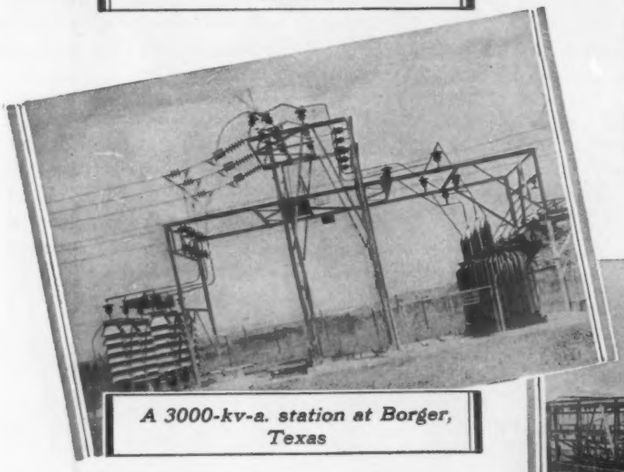
Rialto Building, San Francisco, Calif. 1117 Rowan Building, Los Angeles, Calif. 115 Jackson Street, Seattle, Wash. 505 Lumbermen's Building, Portland, Ore. 525 Symes Building, Denver, Colo. 915 Kearns Building, Salt Lake City, Utah.

Outdoor Stations
for every service condition

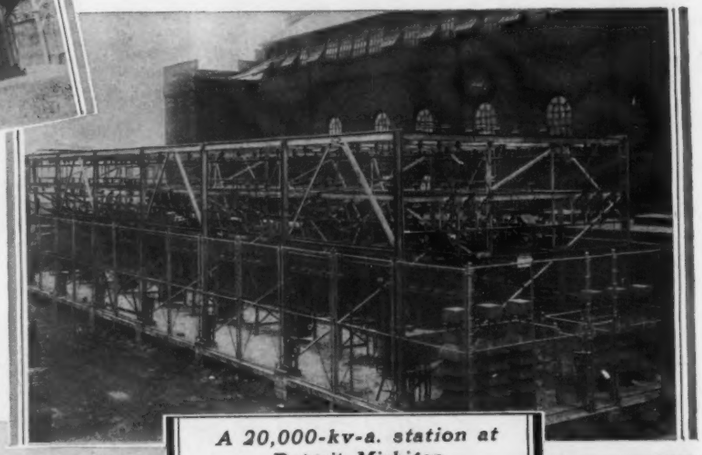
A 1500-kv-a. station at Houlton, Maine

General Electric outdoor switching equipment embodies many refinements which contribute to the high quality of these products. Research, experiment, and test, together with the knowledge acquired in the design and manufacture of equipment for every phase of power distribution, have been combined in apparatus which will meet every service condition.

Because of mass production and quantity purchase of raw materials, prices are low. Because the complete station is designed as a unit, erection is speedily, easily effected.

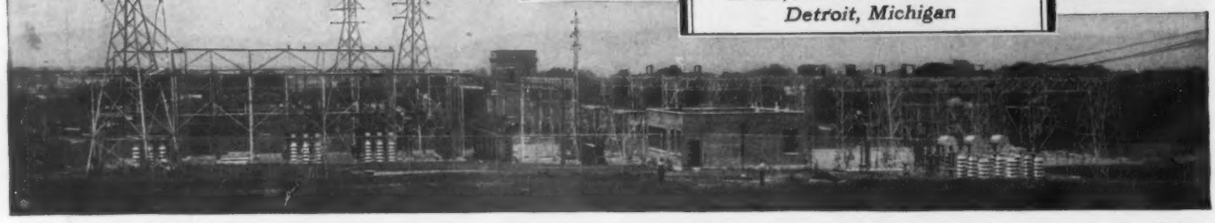


A 3000-kv-a. station at Borger, Texas



A 20,000-kv-a. station at Detroit, Michigan

A 10,000-kv-a. station at Elmira, New York



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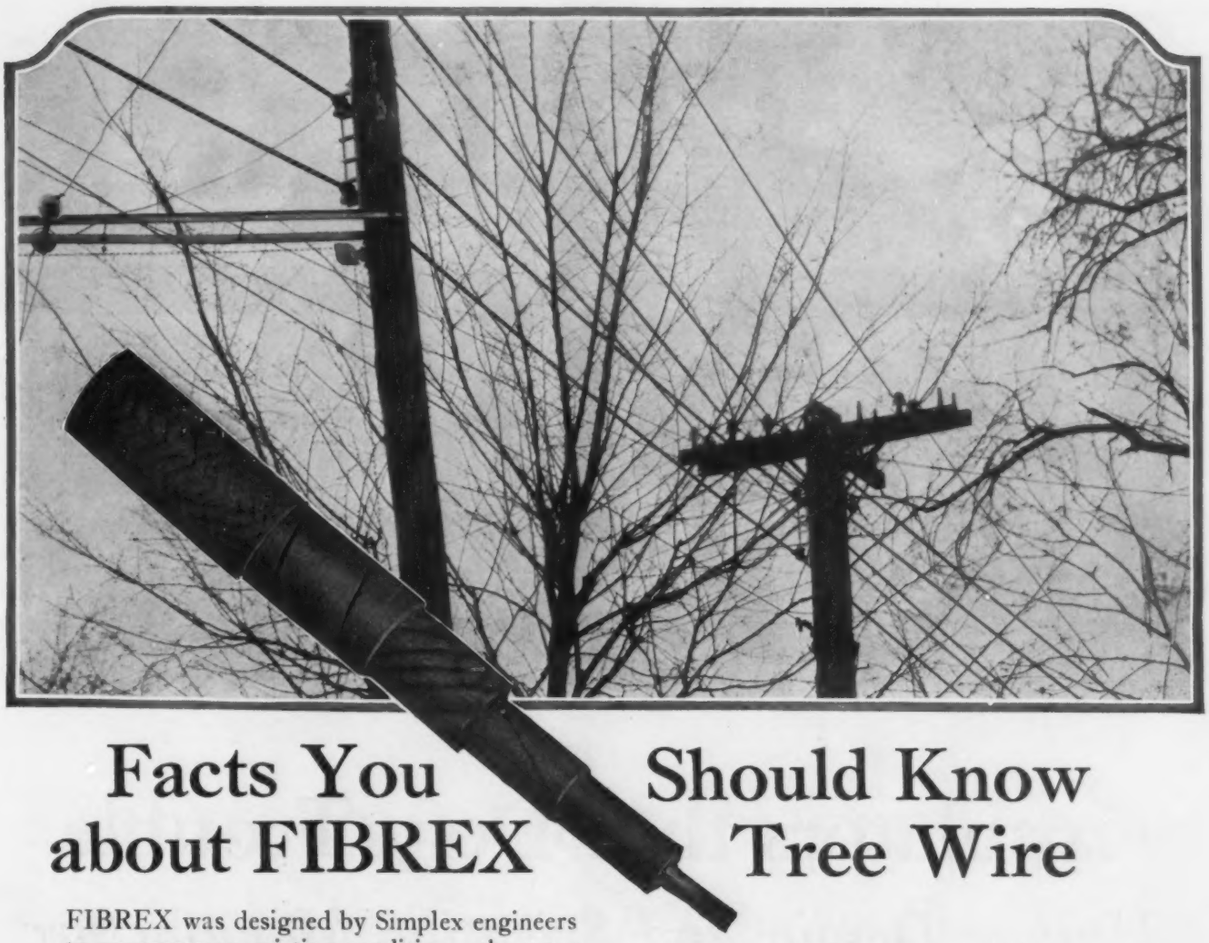

Facts You Should Know about FIBREX Tree Wire

FIBREX was designed by Simplex engineers to overcome an existing condition—the wear of overhead wires by trees and limbs of trees rubbing against them.

FIBREX was first manufactured and sold by us about 1912. Some of the early installations are still in service. When properly made, installations are practically permanent.

FIBREX may be insulated for any commercial voltage. The insulation, specially designed and properly compounded, is entirely adequate, electrically and mechanically for tree wire service.

The entire protection is non-metallic, non-inductive and prevents arcing, short circuits and leakage. FIBREX can be easily spliced into the line by any lineman using an ordinary telegraph splice.

It may be run from pole to pole without extraordinary sag and through trees without disturbing foliage.

If desired, short lengths may be inserted in the line at points of abrasion.

It always remains in position; it cannot creep. It requires little or no inspection after installation. It reduces line repairs and replacements.

Weather conditions have practically no effect upon it. It is not disturbed by swaying and twisting of trees during storms and is not affected by changes in temperature.

The rapidly increasing number of FIBREX installations indicates service ability. Prices, sample and further information furnished on request.

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An important characteristic of the Faradoid design is the remarkably even distribution of the electrostatic stresses about the insulator. This prevents the concentration of stresses on any part of the Faradoid insulator.

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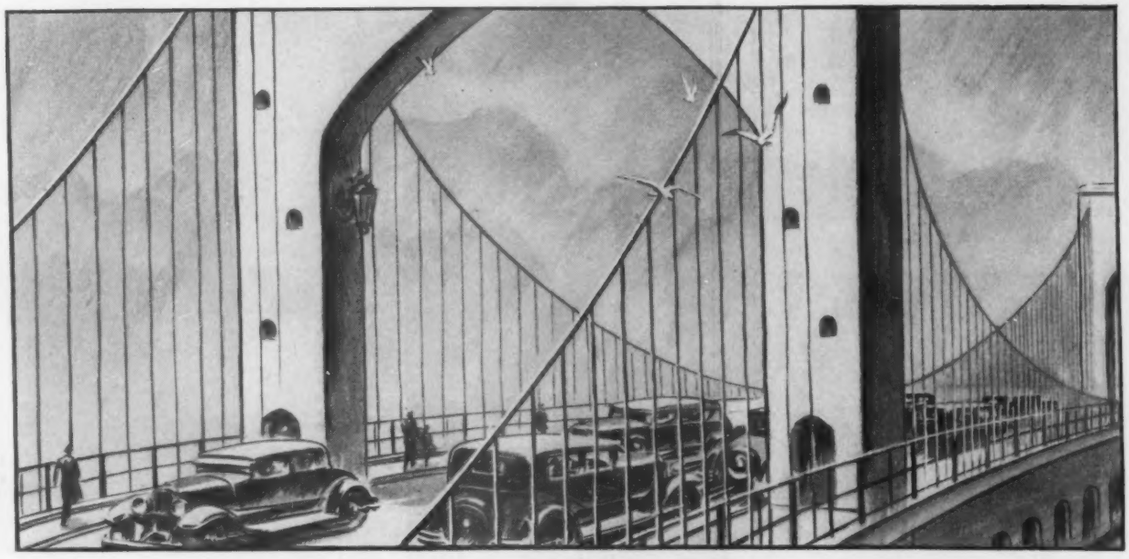

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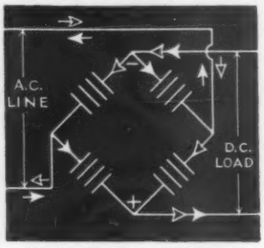

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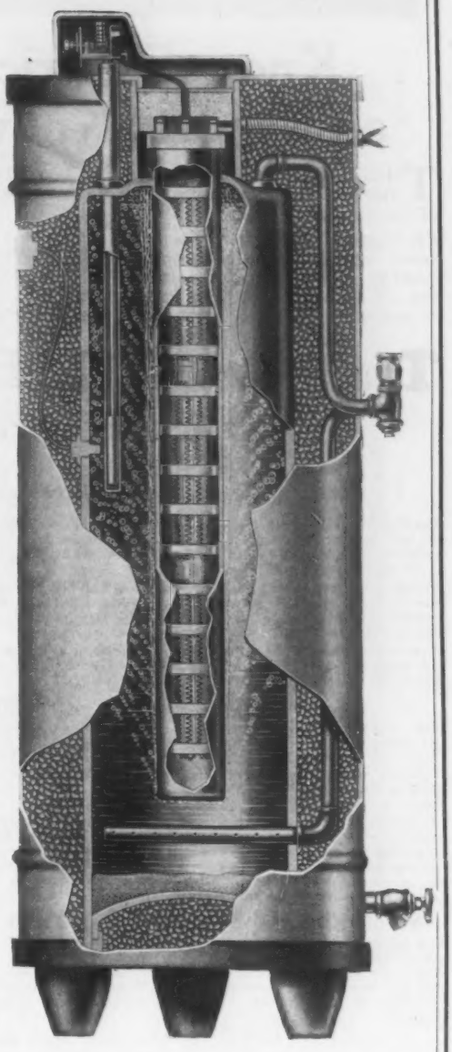

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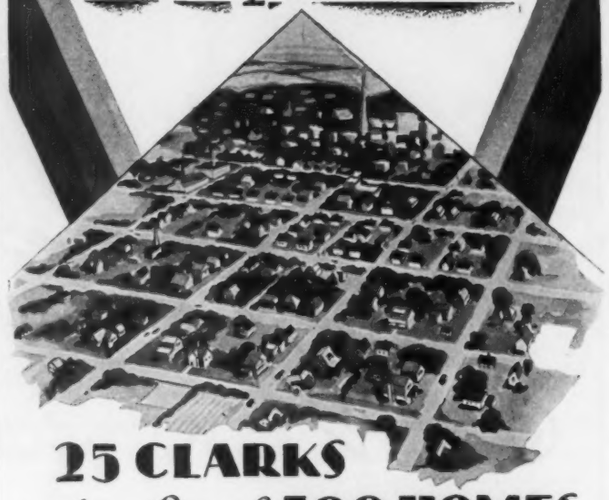

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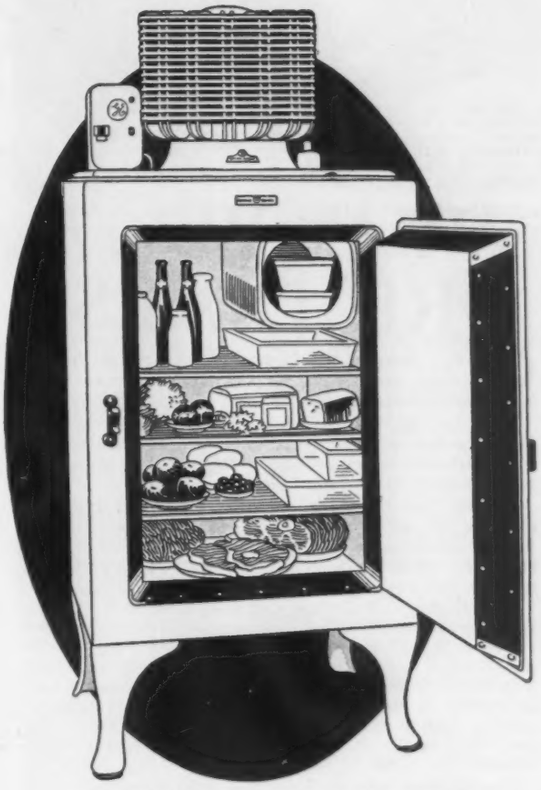

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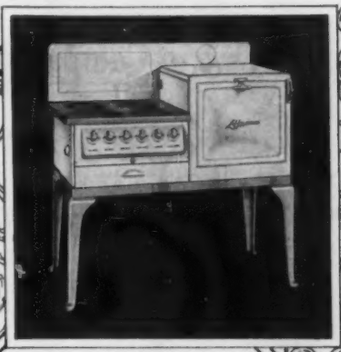

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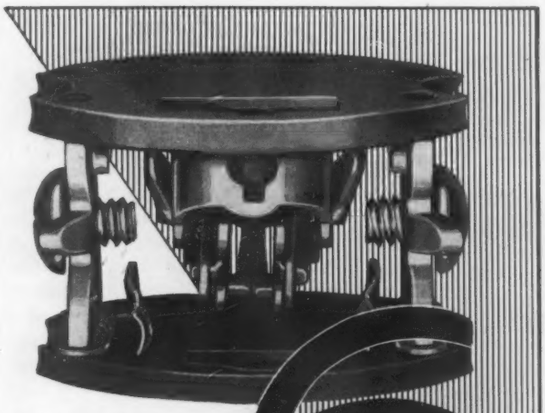

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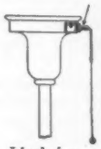

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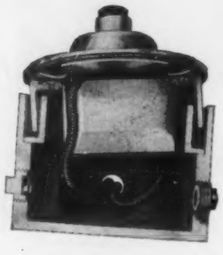

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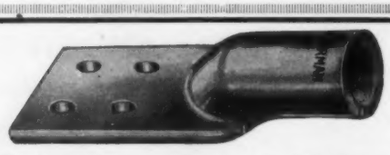

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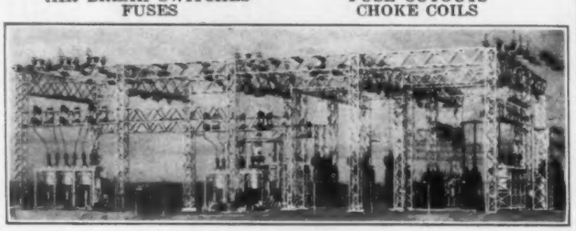

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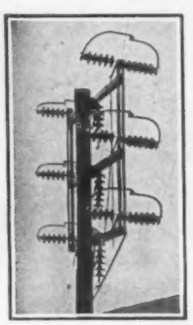


FOR SECTIONALIZING—Specify K-P-F Switches. Manufactured for any voltage. On large hydro-electric developments you will find extensive use of K-P-F high tension switches. They were developed to meet the demand for simple inexpensive switches which could be installed in the circuit at a minimum cost and with little interruption on the line.

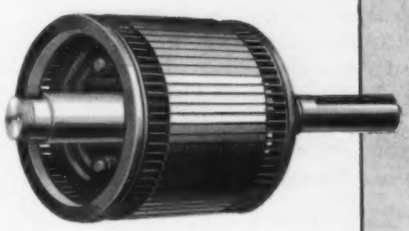
Each unit is self-contained. Switches are shipped complete, ready to bolt to cross-arm. Also suitable for steel tower mounting. Write for bulletin 105.

K-P-F ELECTRICCO.

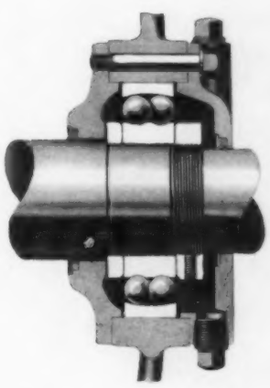
855-859 Howard St., San Francisco

Note the weight of frame, broad heavy feet and compact construction

Why this growing preference?



Short, thick shaft; rotor bars and end rings fused into a unit; ventilated core



Once-a-year Lubrication

Sealed ball bearings require lubrication but once a year. This is further simplified by F-M Measured Grease Lubricant in tubes

You will find the answer in the Fairbanks-Morse Motor itself—an answer which has solved the maintenance and "out of service" problem in many branches of industry. If you have thought that all motors are practically alike—you are just the individual who should see an F-M Motor. For all motors, type for type, are quite similar in *electrical* characteristics, *but what a difference in mechanical construction!* So take an F-M Motor apart—no evidence of construction and materials designed to meet a price. In every detail, frame, field, bearings, rotor, you will find ample evidence of the plus value put into this product.

Your trained appreciation of what constitutes best motor construction practice will lead you inevitably to join the growing preference for Fairbanks-Morse Motors.

Whether your plant uses one motor or five thousand, motors are too important to order from a catalog. Will you write today arranging with F-M engineers for an actual inspection of a Fairbanks-Morse Motor *at your plant?*

FAIRBANKS-MORSE & CO., *Chicago*

32 branches at your service throughout the United States

FAIRBANKS-MORSE MOTORS

FAIRBANKS-MORSE *Motors*

FAIRBANKS-MORSE *FLEX-MOR DRIVE*

Flex-Mor Drive

If you want a drive of superior mechanical efficiency; a drive equally efficient on short or long centers; a silent drive; a drive requiring no lubrication or dressing; a shock-absorbing drive; a drive unaffected by dust, dirt, moisture, atmospheric conditions; *then you need a Flex-Mor Drive!*

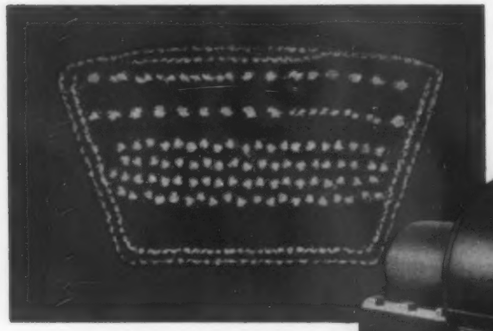
For Flex-Mor, with its truncated "V" belt of rubber, cord and fabric offers a new freedom from power transmission troubles. Exclusive processes of manufacture produce a long wearing belt of such uniformity that even at high speeds there is no snaking or slapping as it moves over the sheaves. Under heavy loads the wedging action between the Flex-Mor belt and the sheaves increases the grip in proportion to the load—no slipping or burning.

Standardized drives consisting of Flex-Mor belts and sheaves are now available for practically all power requirements.

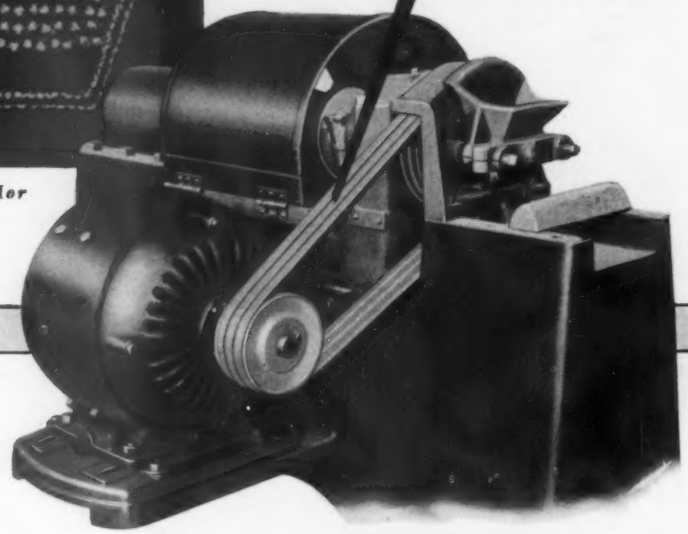
Write today for full details on Flex-Mor; get acquainted with trouble-free power transmission.

FAIRBANKS, MORSE & CO., Chicago

32 branches at your service throughout the United States



A close-up of a Flex-Mor cross section.

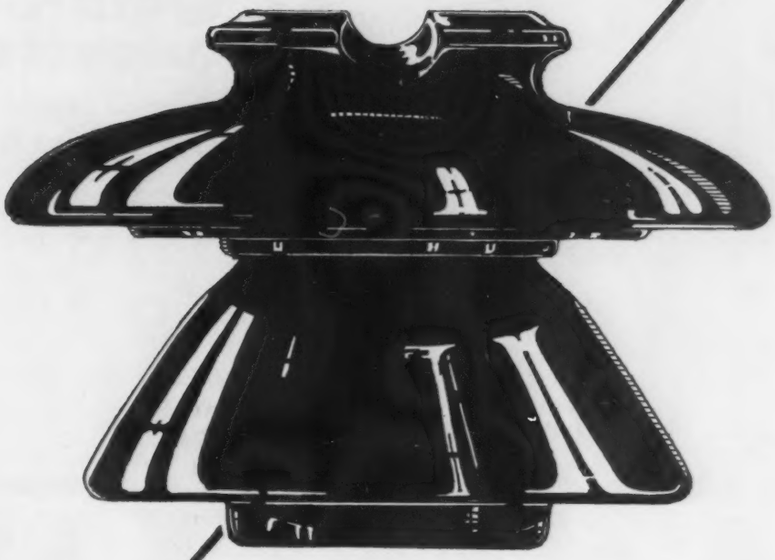


Flex-Mor Drive on a special casting machine

FAIRBANKS-MORSE
Flex-Mor Drive

EA40.20

LOCKE



The design and construction of Locke Multi-part Pin Type Insulators is a definite science. Long experience has dictated the characteristics necessary and sustained experiment and research have furnished the technique to meet these requirements.

Locke 1044 Insulator is representative of the entire line. It is standard on thousands of miles of important transmission lines here and abroad. When you specify Locke Insulators for your lines you are specifying insulators that for thirty-five years have set the standard of quality by which all insulators are judged.

PACIFIC STATES ELECTRIC COMPANY

Distributors for the Pacific Coast

PORCELAIN INSULATORS

KEARNEY DOUBLE DUTY
FUSE AND DISCONNECT CUTOUTS

The Only Extruded Wet Process Porcelain Cutouts on the Market

Generous proportions of porcelain to give extremely high wet and dry flashover values... ¶ No radio interference... ¶ Positive locking cartridge... ¶ Greater safety factors... ¶ Petticoats on outside give greater leakage resistance ... ¶ Fuse blows away from operator... ¶ Mounted at any angle... ¶ No Metal parts exposed except mounting arm.

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for medium voltage lines

Insulate with Glass

Made in sizes up to 15,000 volts.

COST—an important item in Insulators

Hemingray glass possesses every requisite for efficient performance. It does not age or deteriorate, it requires a very low percentage of replacements—it never requires a total replacement. Glass moreover can be produced and sold far below that of any other types of medium voltage insulators because its first cost is practically its last cost—it will give a lifetime of service. Large stocks available at all times.

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WIRES CABLES

CALIFORNIA WIRE

It pays to get acquainted with "California Wire"

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PLANTS AT
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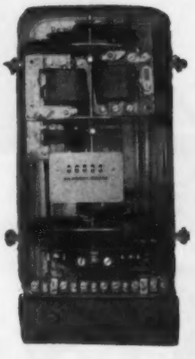
Pacific States Electric Company—Wholesale Distributor

THREE ELEMENT
POLYPHASE METER



Type MBo three element polyphase watt-hour meter for 3-phase 4-wire circuits with unbalanced loads.

The Largest Line of Electricity Meters in the World

LANDIS & GYR, INC.
Herbert Nehls V. P. and G. M.
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When you consider poles you cannot get around the fact that our poles have already given 30 years of service and are still strong. . . .

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Preproved by Performance

Quick Shipment Can Be Made From Stock

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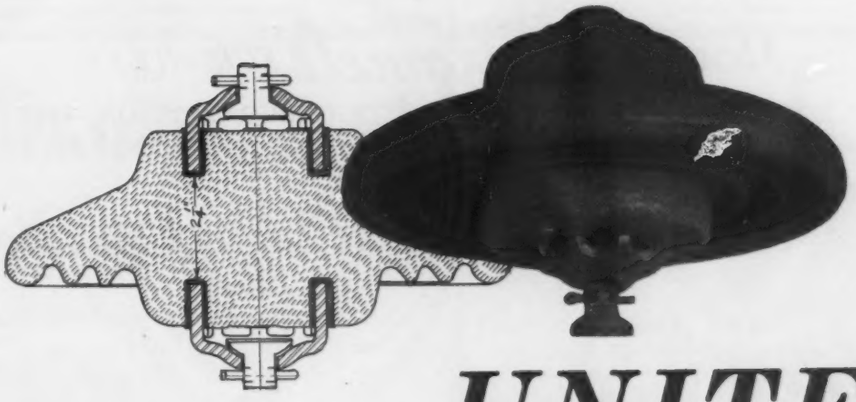
In Step with the
Progress *of the* Industry

ELECTRICAL WEST with its broad editorial policy carries the message of progress and improvement to every section of the field. Serving as it does the electrical industry in the eleven Western states, this publication is in a position to gather first-hand all information of vital interest to its readers. ELECTRICAL WEST is published for and read by the men who are directing the growth of the electrical industry in the West. The men who purchase yearly over $150,000,000 worth of electrical equipment.

Our Advertising

department is available to help you in solving your sales problems in this great territory.



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Mechanical Strength
Electrical Reliability

J-D

High electrical reliability and sturdy mechanical strength are inseparable in insulators. Electrical reliability must have mechanical strength to support it.

The Jeffery-Dewitt process of producing thick porcelain, cementless insulators of both pin and suspension type, provides the ultimate of mechanical and electrical qualities.

The millions of J-D insulators all over the world give daily testimony of J-D excellence.

Many have been in service for long periods of years. They do not crack,—they resist the shattering and puncturing effects of lightning, surges and flashovers. They "hang on" with indomitable strength.

These thick sturdy disks cost no more than easily shattered shells. Investigate J-D Insulators—the proof of their value in eliminating expense, trouble and worry is overwhelming.

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L. Brandenburger, 149 West 2nd South, Salt Lake City, Utah.
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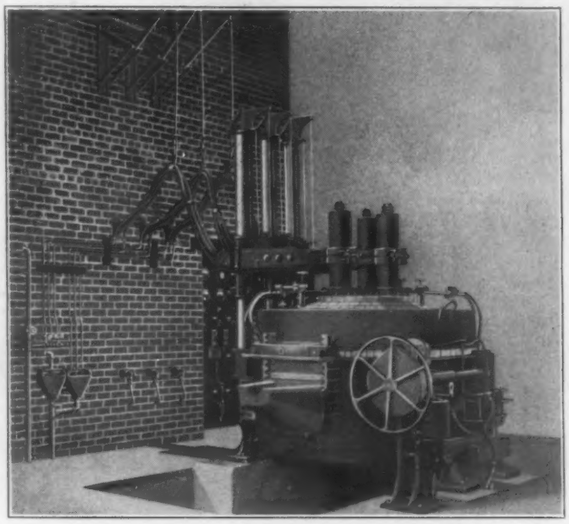
MOORE RAPID 'Lectromelt FURNACES

THE MOST RAPID AND ECONOMIC ELECTRIC FURNACE ON THE MARKET FOR THE PRODUCTION OF ALL GRADES OF IRON AND STEEL.



1½ ton per hour 'Lectromelt furnace suitable for both iron and steel production.

The Ideal Load Builder

Power companies everywhere are co-operating with our engineers in developing the profitable and desirable loads offered by the Moore Rapid 'LECTROMELT furnace.

As a result of over 12 years experience in arc furnace building there is complete coordination of electrical and mechanical features in the 'LECTROMELT furnace. The furnace operates with a high power factor, and well balanced load.

Your 1929 load-building program should include 'LECTROMELT furnaces for iron and steel melting and refining.

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P. O. Box 1125, Pittsburgh, Penna. 273 7th St., San Francisco, Calif.

Power Plant Piping

FOR

Electric Light, Street Railway, Blast Furnace, Steel Works and Industrial Plants of every description

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"I never overlook a bet!"
Writes a W. B. B.

"since I have been getting the WIREMOLD Business Builder. It is a great help to me in getting business because it keeps me on my toes — and points out ways and means that I might have overlooked." Send in your name for mailing list to get latest Wiremold catalogue and literature.

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Automatic Starters
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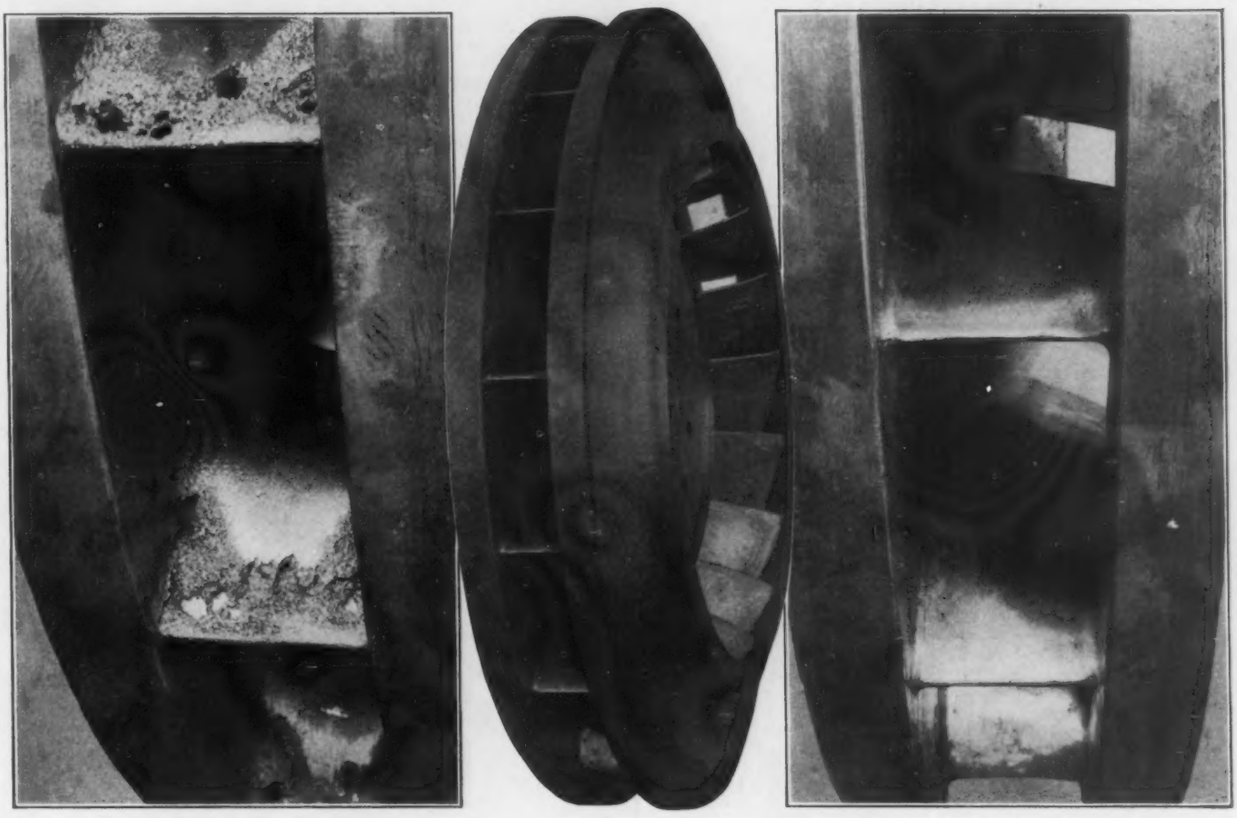
PELTON

Hydraulic Turbine Maintenance



MORE and more consideration is being given to maintenance of hydraulic turbine runners, guide vanes and other parts subject to the effects of corrosion or wear after long periods of service. The advantages are two-fold: First, the maintenance of the hydraulic unit at highest possible efficiency; second, keeping the parts in such condition as to obviate the need for expensive replacements.

The Pelton Water Wheel Co. is in a particularly advantageous position to repair turbine parts in the shortest possible time. This, coupled with the proximity of our works to western power plants, is of great value in reducing time out of service. Complete shop facilities, with an intimate knowledge of hydraulic design, assure the restoration of parts to their original condition.

The unretouched photographs show a turbine runner before and after it was reconditioned. Such work is carried through with greatest possible precision on any make of turbine. Further information will be gladly given.

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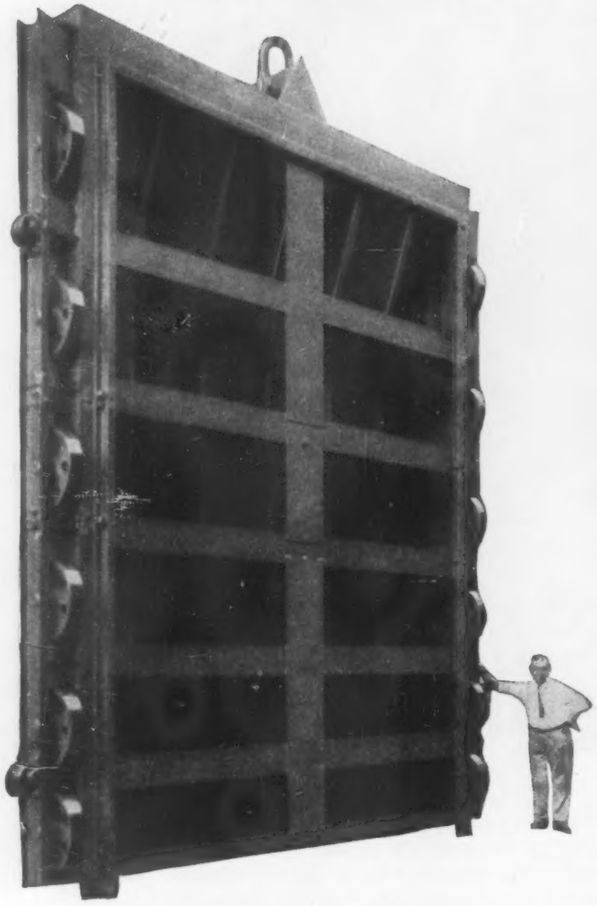
Hydraulic Engineers

2985 Nineteenth St., SAN FRANCISCO **33 Rector St., NEW YORK**

Associated Companies: I. P. Morris & De LaVergne, Inc., Philadelphia, Pa.; Dominion Engineering Works, Ltd., Montreal. **Pacific Coast Representative** for Larner Engineering Co., Philadelphia, Pa.

PELTON

A Step Forward in Modern Hydro-Electric Equipment



The Newport News *"All-Welded"* Head Gate

"ALL-WELDED" Head Gate, 19 ft. by 14 ft. made for the Devil's River, No. 1 development of the Central Power and Light Co., San Antonio, Texas. (L. F. Harza, Chicago, Consulting Engineer.)

Unexcelled facilities for building Hydraulic Turbines, Butterfly Valves, Penstocks, Head Gates, Crest Racks, Rack Rakes.

Hydro-Electric Division

NEWPORT NEWS SHIPBUILDING & DRYDOCK CO.
Newport News, Virginia Charlotte, N. C.
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ORANGEBURG FIBRE CONDUIT

Big Loads *Quickly* Handled

There is no delay or difficulty in loading Orangeburg Conduit for transportation to the job. Each piece is five feet in length. Each is uniform in size, strength and weight. There are important considerations in every phase of handling and laying conduit.

Orangeburg Conduit, besides being made carefully, has behind it the best of all evidence of its quality—namely performance in actual service. It has made good on the job for 35 years.

The Fibre Conduit Co.
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The Primary Reason for the Excellence of

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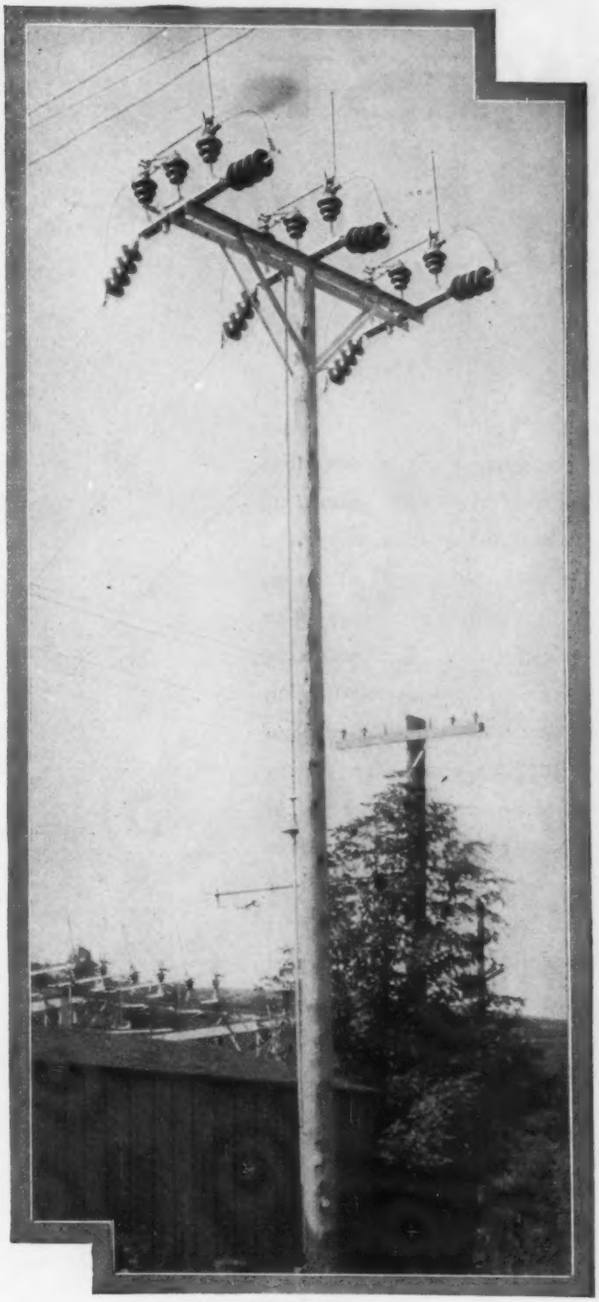
. . . is that it possesses the most necessary requirement which is indispensable to the ultimate success of the advertiser—namely . . .

The Confidence of the Reader!

"The Margin of Quality Distinguishes"



Type "TTL," one of the several types of Hi-Pressure Contact Switches, used here for sectionalizing purposes. Also suitable for general air-break service up to and including 73 KV.

Guardians

of your transmission lines

Hi-Pressure Contact Switches—backed by years of service and designed as a leader for years to come—is the unquestioned choice for your transmission system.

Day in and day out, through rain, sleet, ice, dirt and the constant formation of oxide film —the Hi-Pressure Contact can be depended upon to always carry it's rated load, or make and break contact when necessary. Hi-Pressures in the contact, plus a wiping action, is the only practical way of removing these weather formations or oxide film from the contact surface.

There is a Hi-Pressure Contact Switch for your every need. Let us show you some in action.

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ENGINEERING CO., GREENSBURG, PA.

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HI-PRESSURE CONTACT

THE WEST

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HERE IS A LAND of outstanding achievement—Here in the West, with hundreds of streams, each a potential source of electric power, a wealth of water is generating more hydro-electric power than any other section of the country. Steam is also getting a major share of attention and the generation of power by this method promises to be greatly developed during the next five years. ¶ Generating capacity is growing with the power demand, transmission voltages are increasing, the lines themselves have stretched over hundreds of miles of territory to cover the West's great distances, the consumption of power is increasing at a tremendous rate—all this expansion requires the purchase and installation of new electrical apparatus, equipment and supplies. ¶ It is one thing to meet the requirements of the Western power companies for bigger, better and more efficient equipment—it is quite another to place these merits before the men who specify, recommend and buy the vast amount of material used. These men and others constitute the readers of ELECTRICAL WEST—it is their paper and is allied with them to meet the power problems of the West.

ELECTRICAL WEST

a McGraw-Hill Publication

A. B. C. **883 Mission Street ▲ San Francisco, Calif.** A. B. P.

¶ The coming of natural gas to the San Francisco Bay area marks the beginning of a new era in building the West. Industrial leaders have now another reason why they should locate their plants near the Golden Gate.

¶ So when a new factory chooses Northern California as an ideal location, because of the cheap natural gas, there arises new outlets for the sale of transformers, wiring and other indispensable electrical factory equipment.

PACIFIC GAS AND ELECTRIC COMPANY

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Owned :: Operated :: Managed
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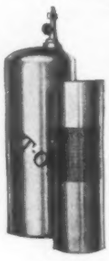
Prest-O-Lite Is Unusually Convenient

. . . easy to handle on a pole, underground, in the transformer room, or in the shop . . . easy to work in corners and close quarters . . . easy to regulate to the exact heat required . . . no pumping, no preheating, no waste of fuel between jobs.

Electrical Contractors and Utility Companies prefer Prest-O-Lite blow-torches because they speed up the work and do a better job at lower cost.

Ask your local Prest-O-Lite Gas Distributor to demonstrate this equipment for you or write us for complete information.



Prest-O-Lite is available everywhere. Anyone of 15,000 Prest-O-Lite Exchange Stations can supply you quickly with a full tank.

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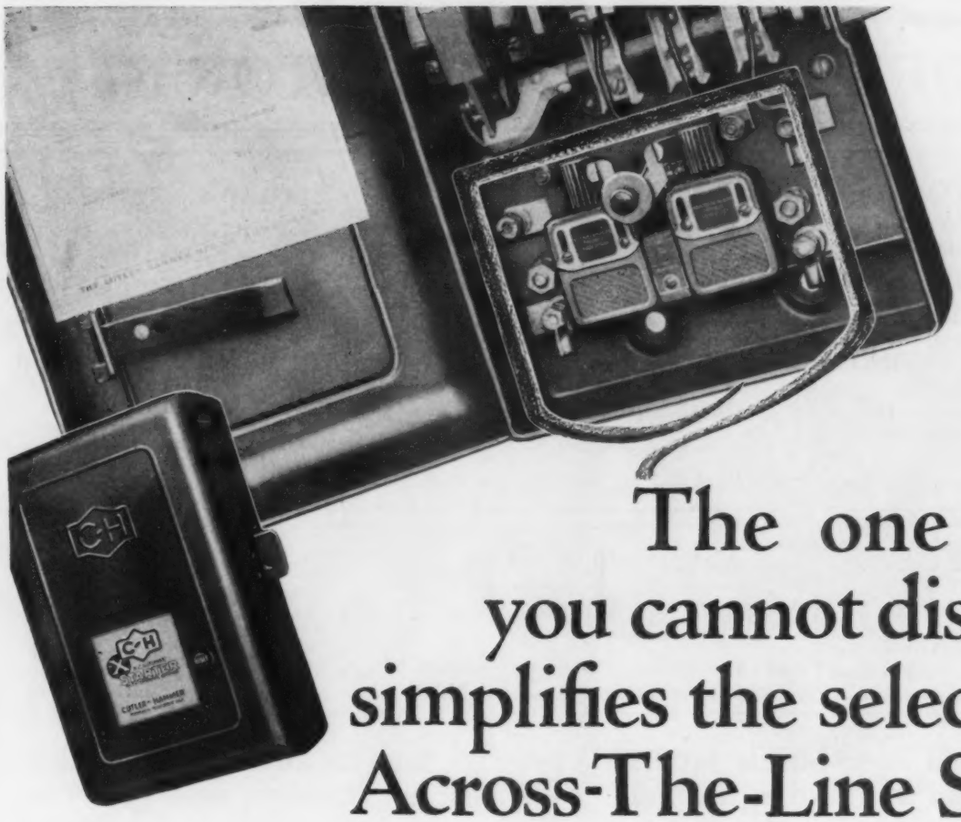

The one factor you cannot disregard simplifies the selection of Across-The-Line Starters

CHOOSING an across-the-line starter is enormously simplified . . . if you'll only remember that above all else it must give protection to the motor! Protection . . . which permits the motor to give the last fraction of its capacity without danger.

Such protection is possible only when the overload is consistently accurate. Cutler-Hammer has developed an eutectic alloy which avoids the weaknesses and faults which commonly interfere with the accuracy of overload devices. This alloy has an exact temperature at which it melts . . . *sharply*; below which it "freezes" . . . *suddenly*. It stands alone in its unvarying accuracy.

Moreover, it is employed in such a form that no replacements are necessary to reset the starter after the overload relay trips. To put motor and control back in service, it is necessary only to press the button on the outside of the case.

Nor has any construction unit in C-H 9586 Across-the-Line Starters been slighted. The C-H 9586 Starter will withstand any duties you may demand of it . . . for a greater period of years. It has been built to . . . and tested by . . . a "standard of millions of operations".

More detailed information on request

Every Feature of C-H 9586 Starter is built to the "standard of millions of operations"

1—*Thermal Overload Relays—more accurate protection—full use of motor's power.*

2—*Pushing button on outside of case resets relay.*

3—*Adaptable for wide range of motor sizes.*

4—*Double pull solenoid type magnet—quick action—cool operation.*

5—*Quick break husky contacts—positive operation—long life.*

6—*Hardened and ground steel bearings in switch mechanism.*

7—*Both entire switch assembly or individual fingers easily removed.*

8—*Contacts are quickly removed, dressed, or replaced.*

9—*Chimney type arc shields quickly carry arc away from contacts, increasing life.*

10—*Convenient access to every part—entire panel easily removed for speedy wiring.*

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Pioneer Manufacturers of Electric Control Apparatus
1222 St. Paul Avenue Milwaukee, Wisconsin

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The Control Equipment Good Electric Motors Deserve

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Established 1896
Design and Construct
Organize, Manage, Operate and Finance
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Employers are invited to use this service, representing over fifty thousand members, to supply their needs for all classes of engineers, chemists, executives and assistants.

Under Direction of

American Society of Civil Engineers.
American Society of Mechanical Engineers.
Engineers Club of San Francisco.
American Institute of Mining and Met. Engineers.
American Institute of Electrical Engineers.
California Section American Chemical Society.

K-187-X-8384-S-R-411-C Professor of Electrical Engineering, to begin Sept. 20, 1929. Must have a Master's Degree and be capable of carrying graduate and research work. Must also be willing to carry a reasonable amount of junior and senior under-graduate work in electrical engineering. Preference would be given to a man with some experience in transmission and distribution. Must be mathematically minded and with a reputation as a superior teacher. Apply by letter. Position 9 months. Location, Middlewest.

X-8400 Hydro-Electric Designer, specially experienced on the hydraulic end. Apply by letter. Salary, $400-$500 a month. Location, South America. Headquarters, New York City.

K-185-X-8352-C-S Instructor in Electrical Engineering, to teach courses in alternating current theory. Man having an interest in electrical communication courses preferred. Apply by letter, including full particulars and photograph. Salary $1,800-$2,200. Location, West.

K-188-X-8396-S-R-409-C Electrical Engineering Graduate of university of recognized standing desired by Middlewest utility. Applicant should have from one to five years experience in electrical utility work and should have superior mathematical, technical and analytical ability to properly qualify him for wide variety of engineering studies made by company. Apply by letter. Location, Middlewest.

R-2530-S Mechanical and Electrical Engineers, not over 30, preferably with experience in the production and refining of oil, to train for sales work. Will probably start in drafting room. Must have comercial ability. Apply by letter with photo and details of experience. Location, Southwest.

R-2519-S Associate Professor of Electrical Engineering, for a small Western university; would have to teach freshman as well as senior subjects. Apply by letter with references and photo. Salary open.

K-186-X-8383-S-R-410-C Graduate Assistantships, open to graduates in electrical engineering. Positions permit half time to be devoted to the pursuit of graduate work in electrical engineering toward the M.S. degree. The other half time is assigned to teaching duties in the electrical engineering laboratory. Period of service is from Sept. 20 to June 20. Apply by letter. Salary $800. Location, Middlewest.

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R-2477-S Electrical Engineer, about 4 years out of college, preferably with good knowledge of industrial plant operating conditions. Work includes inspections, report writing and checking estimates, for about 12 months. Salary $200 month. Location, San Francisco.

All correspondence in connection with the above must be addressed to

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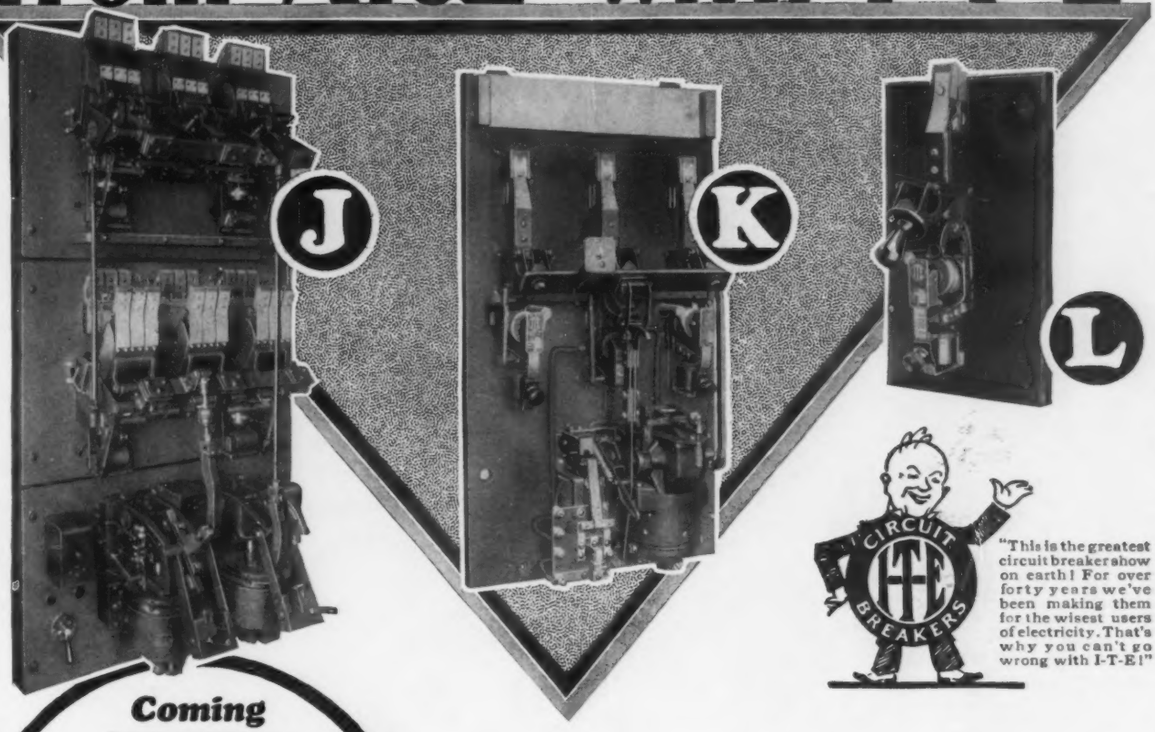

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